[redacted]

TM5-1280

4

MOBILE PUGMILL MIXING PLANT

MODEL 841 PUGMILL MIXER
MODEL 831 SINGLE-DRUM DRYER
MODEL 821 SOILS PREPARATION UNIT
MODEL 831 BUCKET ELEVATOR

BARBER-GREENE COMPANY

WAR DEP'T PURCHASE ORDERS 55857 56600 57639

WARNING

SPARE PARTS can be supplied promptly and accurately only if positively identified by correct part number and correct part name.

FURNISH THIS INFORMATION ON ALL REQUISITIONS.

WITHOUT FAIL, on all requisitions, give name of machine, name of manufacturer, model or size, manufacturer's serial number of each machine and subassemblies attached to machine, and components and accessories for which spare parts are required.

List spare parts for only one make or kind of machine on each requisition.

Requisitions must be double spaced to provide room for office notations when necessary.

CQD SPR 304

TM5-1280

WAR DEPARTMENT

TM5-1280, Maintenance Manual and Parts Catalog. Asphalt and Soil Aggregate Plant, published by the Barber-Greene Co., is furnished for the information and guidance of all concerned.

(AG-62.11 (4/26/41) PC (C), June 10, 1941.)

G. C. MARSHALL
Chief of Staff.

Official:
J. A. ULIO,
Major General,
The Adjutant General.

MOBILE PUGMILL MIXING PLANT

MODEL 841 PUGMILL MIXER
MODEL 831 SINGLE-DRUM DRYER
MODEL 821 SOILS PREPARATION UNIT
MODEL 831 BUCKET ELEVATOR

BARBER-GREENE COMPANY, Aurora, Illinois

Printed in U.S.A.

First Printing 9-42-1.5M
Second Printing 4-43-1.7M

OPERATOR'S MANUAL

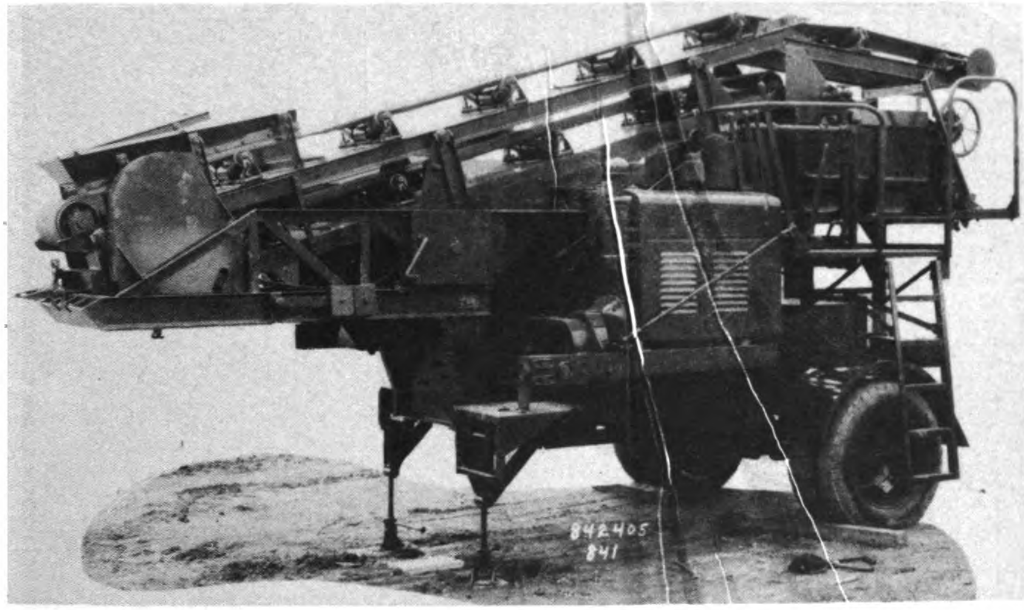
CONTENTS

BARBER-GREENE COMPANY, Aurora, Illinois

841 MIXER CAPACITIES AND CONSUMPTION

Where Used	Description	Capacity	F. Temp.	Grade	Nearest Army Grade	Consumption per 100 Hours
Engine Crankcase	Oil	7 Qts.	Below 0° 0° to 32° 32° to 90° Over 90°	SAE 10 SAE 20 SAE 30 SAE 40	U.S.Army Spec.#2-104-A of corresponding viscosity	5 U.S. Gallons
Air Cleaner	Oil	1 Pint	Same as Engine Crankcase			2 Qts.
Water Pumps	Grease			#4 Calcium Base	U.S.Army Spec.#2-109	1 lb
Machinery	High Temp. Grease			Marfak #3	U.S.Army Spec.#2-110	12 lbs.
Machinery	High Pressure Grease		Below 0° 0° to 32° 32° to 200°	Stazon Marfak #0 Marfak #2	U.S.Army Spec.#2-106 U.S.Army Spec.#2-106 U.S.Army Spec.#2-107	25 lbs.
Speed Reducer	Trans. Lub.	2-1/2 Pts.	Below 0° 0° to 32° Over 32°	SAE 80 SAE 90 SAE 140	Fed. VV-L-761 SAE 80 Fed. VV-L-761 SAE 90 Fed. VV-L-761 SAE 90 or SAE 80-140	2 Qts.
Bevel Gear Box	Trans. Lub.	3 Qts.	Same as Speed Reducer			4 Qts.
Pugmill Gear Box	Trans. Lub.	4 Qts.	Same as Speed Reducer			5 Qts.
Engine Fuel	Gasoline	12 Gal.				330 U.S. Gals.
Burner Fuel	Kerosene or Diesel Oil	20 Gal.	(Operates from 1 to 3 hrs. per day)			100 to 300 U.S. Gals.
Engine Radiator	Coolant	4 Gal.				

General Information
Barber-Greene Model 841 Mixer



Application:

Mixing bituminous material in conjunction with 831 Dryer and 831 Elevator.

Mixing clay soil aggregate in conjunction with 821 Soil Unit and 831 Elevator.

Capacity: Approximately 25 tons per hour in bituminous mixing.
Approximately 40 tons per hour in stabilized mixing.

Overall Dimensions: Length 21'-0"
Width 8'-0"
Height 10'-5"

Type of Mounting:
(Trailing Axle used with Dolly or truck-tractor.)

Dual 7.50" x 20" 8 ply tires
Wheel base 13'-2"
Axle Clearance 1'-2"
Turning Radius 25'-0"
Gross Contact Area 162 Sq. inches at 55 lbs pressure.

Operating Weights: On Trailing Axle - 10,200 lbs.
Load on Fifth Wheel or Dolly - 3,800 lbs.

SHIPPING DATA

Cubage - Not Boxed Assembled - Approximately 1765 cu. ft.

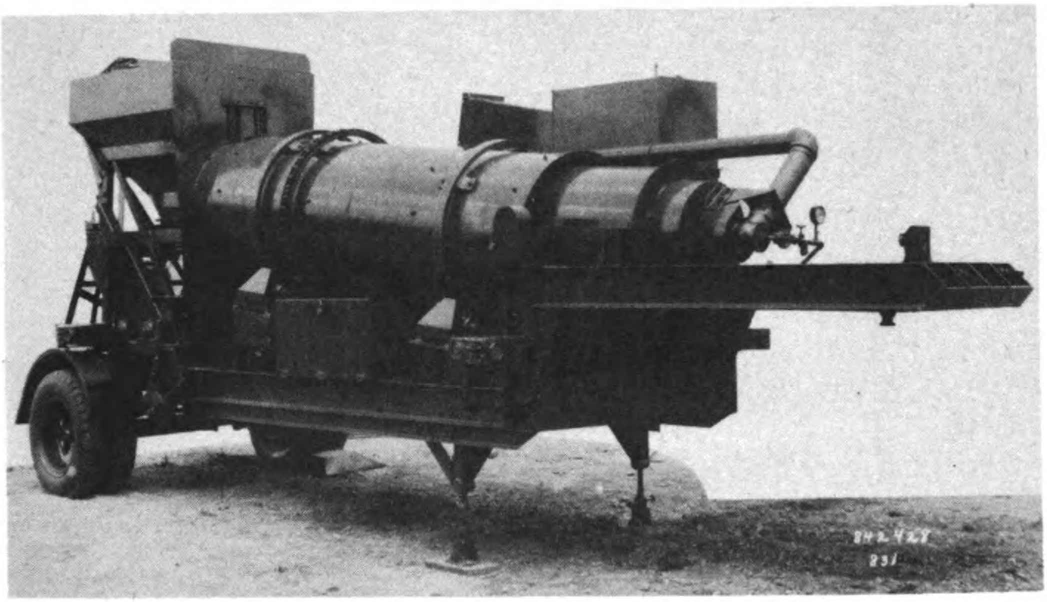
Boxed for Export Cubage 2,000 cu. Ft.
Weight 14,800 lbs. (approximately)

Rail Shipment: 2 Machines per Flat Car (Assembled or assembled and boxed)

831 DRYER CAPACITIES AND CONSUMPTION

.e Used	Description	Capacity	F. Temp	Grade	Nearest Army Grade	Consumption per 100 Hours
Engine Crankcase	Oil	7 Qts.	Below 0° 0° to 32° 32° to 90° Over 90°	SAE 10 SAE 20 SAE 30 SAE 40	**U.S.Army Spec.#2-104-A of corresponding viscosity.**	5 U.S. Gals.
Air Cleaner	Oil	1 Pt	Same as Engine Crankcase			2 Qts.
Blower	Oil	1-1/2 Pts.	Same as Crankcase			1 Qt.
Water Pumps	Grease			#4 Calcium Base	U.S.Army Spec.#2-109	1 lb.
Machinery	High Temp. Grease			Marfak #3	U.S.Army Spec.#2-110	12 lbs.
Machinery	High Pressure Grease		Below 0° 0° to 32° 32° to 200°	Stazon Marfak #0 Marfak #2	U.S.Army Spec.#2-106 U.S.Army Spec.#2-106 U.S.Army Spec.#2-107	25 lbs.
Speed Reducer	Trans. Lub.	2-1/2 Pts.	Below 0° 0° to 32° Over 32°	SAE 80 SAE 90 SAE 140	Fed. VV-L-761 SAE 80 Fed. VV-L-761 SAE 90 Fed. VV-L-761 SAE 90 or SAE 80-140	2 Qts.
Bevel Gear Box	Trans. Lub.	3 Qts.	Same as Speed Reducer			4 Qts.
Engine Fuel	Gasoline	12 Gal.				330 U.S. Gals.
Oil Burner	Fuel Oil	200 Gal.		#4 Fuel Oil SU Viscosity 90-125 145000 BTU per gal.	#2 Diesel Oil SU Viscosity approx. 35 120,000 to 135,000 BTU per gal.	
	(Consumes 1-1/2 x 3-1/2 gallons per ton of aggregate)					
Engine Radiator	Coolant	4 Gal.				

Barber-Greene Model 831 Dryer



Application:

Drying aggregate for bituminous mixing in conjunction with 831 Elevator and 841 Mixer.

Capacity: Approximately 25 tons per hour

Overall Dimensions: Length - 24'-10"
Width - 8'-0"
Height - 10'-5"

Type of Mounting:

Trailing Axle used with Dolly or truck-Tractor
Dual 7.50 x 20" 8 ply tires
Wheel Base - 20'-4"
Axle Clearance - 1'-2"
Turning Radius - 25'-0"
Gross Contact Area - 162 Sq. inches at 55 lbs. pressure

Operating Weights: On trailing Axle - 9,500 lbs.
Load on Fifth wheel or Dolly - 5,000 lbs.

SHIPPING DATA

Cubage - Not Boxed Assembled - 2,000 Cu. Ft.

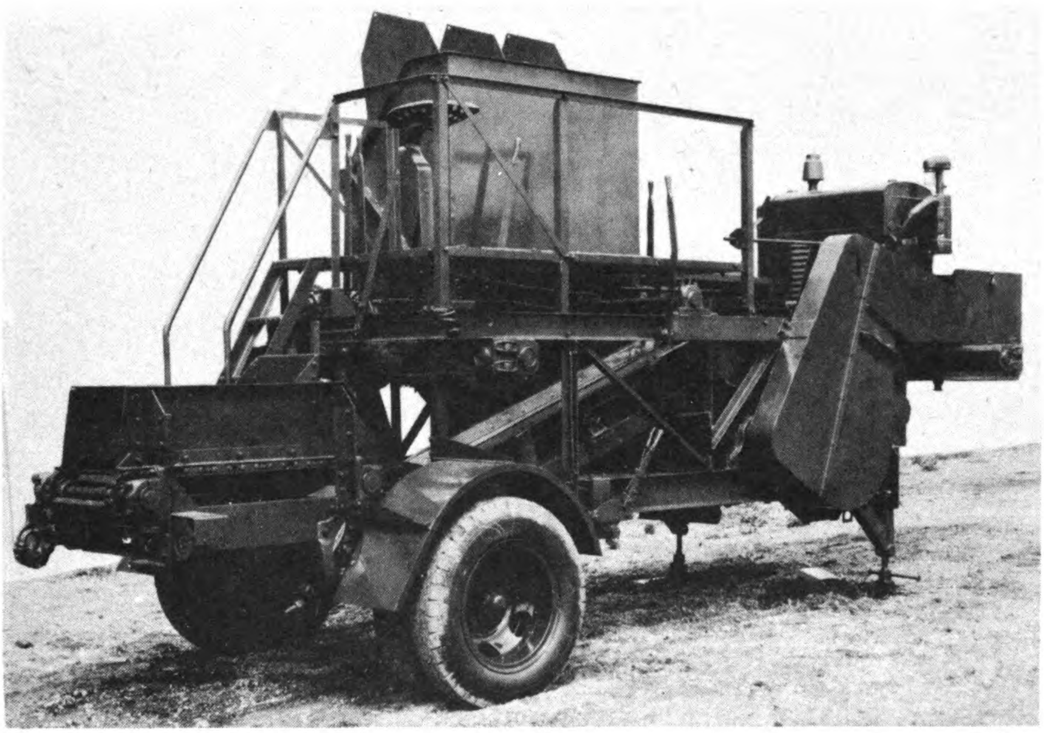
Boxed for Export Cubage - 2250 Cu. Ft.
Weight - 14,800 lbs.

Rail Shipment: 2 Machines per Flat Car (Assembled or assembled and boxed)

821 SOIL UNIT CAPACITIES AND CONSUMPTION

Where Used	Description	Capacity	F. Temp.	Grade	Nearest Army Grade	Consumption per 100 Hours
Engine Crankcase	Oil	7 Qts.	Below 0° 0° to 32° 32° to 90° Over 90°	SAE 10 SAE 20 SAE 30 SAE 40	U.S.Army Spec.#2-104-A of corresponding viscosity.	5 U.S. Gals.
Air Cleaner	Oil	1 Pt.	Same as Engine Crankcase			2 Qts.
Water Pumps	Grease			#4 Calcium Base	U.S.Army Spec.#2-109	1 lb.
Machinery	High Pressure Grease		Below 0° 0° to 32° 32° to 200°	Stazon Marfak #0 Marfak #2	U.S.Army Spec.#2-106 U.S.Army Spec.#2-106 U.S.Army Spec.#2-107	25 lbs.
Speed Reducer	Trans. Lub.	2-1/2 Pts.	Below 0° 0° to 32° Over 32°	SAE 80 SAE 90 SAE 140	Fed. VV-L-761 SAE 80 Fed. VV-L-761 SAE 90 Fed. VV-L-761 SAE 90 or SAE 80-140	2 Qts.
Bevel Gear Box	Trans. Lub.	3 Qts.	Same as Speed Reducer			4 Qts.
Engine Fuel	Gasoline	12 Gal.				330 U.S. Gals.
Engine Radiator	Coolant	4 Gal				

Barber-Greene Model 821 Soil Preparation Unit



Application:

Preparing and proportioning clay soil aggregate in conjunction with 831 Elevator and 841 Mixer.

Capacity:

Approximately 40 tons per hour.

Overall Dimensions: Length - 23'-3"
Width - 8'-0"
Height - 10'-0"

Type of Mounting: Trailing Axle used with Dolly or Truck-Tractor
Dual 7.50 x 20" 8 ply tires
Wheel Base - 16'-0"
Axle Clearance - 1'-2"
Turning Radius - 25'-0"
Gross Contact Area - 162 sq. inches at 55 lbs. pressure

Operating Weights: On Trailing Axle - 8800 lbs.
Load on Fifth Wheel or Dolly - 4900 lbs.

SHIPPING DATA

Cubage - Not Boxed
Assembled - 1860 Cu. ft.

Boxed for Export
Cubage - 2110 Cu. ft.
Weight - 14000 lbs.

Rail Shipment:
2 Machines per Flat Car
(Assembled or assembled and boxed)

BARBER-GREENE COMPANY, Aurora, Illinois

Barber-Greene Model 831 Bucket Elevator

Application:

To elevate aggregates to hoppers on 821 Soil Preparation Unit or 831 Dryer for bituminous mixing or clay soil aggregate preparation.

Capacity:

Approximately 40 tons per hour.

Overall Dimensions:

Length - 17'-0"
Width - 5'-8"
Height - 5'-0"

Type of Mounting: Trailing Axle - used with Towing Pintle
Single 7.50 x 20" 8 ply tires
Axle Clearance - 1'-2"
Turning Radius - 20'-0"
Gross Contact Area - 81 Sq. inches at 55 lbs. pressure.

Operating Weights: On Trailing Axle 2900 lbs.

SHIPPING DATA

Boxed for Export
Cubage - 550 Cu. Ft. Cubage - Not Boxed
Weight - 3,000 lbs. Assembled - 500 Cu. Ft.

Rail Shipment: 4 Units per Flat Car
(Assembled or assembled and boxed)

831 ELEVATOR CAPACITY AND CONSUMPTION

Where Used	Description	F. Temp	Grade	Nearest Army Equivalent	Consumption 100 Hours
Machinery	High Press. Grease	Below 0° 0° to 32° 32° to 200°	Stazon Marfak #0 Marfak #2	#0 #0 #1	10 lbs.

INTRODUCTION

This booklet is intended to be an elementary, non-technical instruction manual for use with the Barber-Greene mobile paving machines. Before beginning a detailed description of the operation and care of these machines, it is necessary for the reader to have a general understanding of the principles involved and a brief knowledge of the various paving mixtures and materials themselves.

These machines are designed to prepare and mix various types of paving mixtures. It is therefore important that the person in charge not only thoroughly understand the operation of these machines, but also to be able to select a satisfactory paving mixture suited to the particular job from the materials available, and to be able to set the machines to get this desired mixture. The section devoted to construction materials is simply a brief discussion of the common materials with only enough information given to enable the inexperienced operator to use them in conjunction with the machines. If further information is desired, it can be obtained from other sources.

These machines were designed especially for maintenance and repair work, which means they will be used mostly for simple, durable mixes such as simple bituminous construction and soil-aggregate construction. Since most jobs will be small-possibly repairing and filling holes in roads or airports-the machines will not be set up long at one jobsite. Therefore they are entirely self-contained, are of semi-trailer design to be highly mobile, and they are easy to set up, requiring only a brief delay before actual mixing can begin. The operation of the plants is, likewise, in keeping with the idea of speed and simplicity for the setting of a gate insures a successful uniform flow of mixed material. Versatility is another feature, since the plants can handle almost any kind of material or mix with very little change necessary. However, for maintenance and repair work, it is usually desired to utilize the materials at hand, possibly adding any necessary material which is lacking, to get a satisfactory mix.

Therefore to clarify the discussion, we shall refer only to this type of simple construction when describing the plants.

In Bituminous Construction we add small measured quantities of bituminous materials (asphalt, tar) to a proportioned mixture of aggregate (sand, gravel, crushed stone, etc) to get a permanent, waterproofed traffic surface which will withstand traffic abrasion.

In Soil-Aggregate Construction we add soil or clay and water to the proportioned aggregate to get a low cost mixture of high stability. This latter mix is used mainly as a base for a bituminous surface mat, where the natural Soil is so unstable that it is unable to support traffic. Of course, bituminous construction can be used for the same purpose, but because quite a large amount of material is used, it is desirable to use the materials at hand without depending upon a limited supply of asphalt, so soil-aggregate construction comes into use whenever possible.

The actual preparation of these two different mixes is of course quite different, requiring different machines to process them. However, in both cases the final major step is a thorough mixing together of all the materials. This can be done in one machine, therefore this machine is used in both setups.

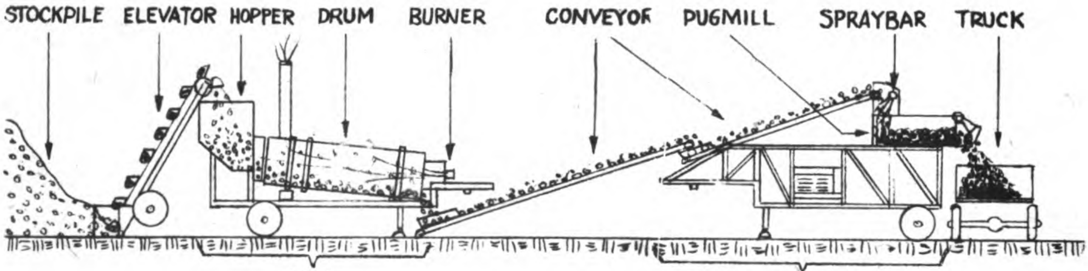
This machine is known as the 841 MIXER and its basic unit is a twin set of rotating paddles called a pugmill. Here the bituminous material (asphalt, tar) or water (for soil-aggregate construction) is sprayed on the already prepared and proportioned aggregate and thoroughly mixed to get a uniform, homogeneous mixture.

The primary or preparation unit in the Bituminous mixing plant setup is known as the 831 DRYER. The basic part of this unit is a large, rotating drum wherein the aggregate is heated and dried as it passes through. This drying is necessary to bituminous construction because of the peculiar behavior of asphalt in the presence of moisture -- it will not adhere to materials which are wet. The 831 DRYER also serves another purpose, that of proportioning the amounts of the aggregate as it is fed into the drum. This is necessary in order to get a stable mixture which will hold up under traffic.

In the Soil-Aggregate mixing plant setup the primary or preparation unit is known as the 821 SOIL PREPARATION UNIT. Here the soil (clay) is measured and then pulverized by crusher rolls so that it will be mixed thoroughly with the aggregate in the 841 MIXER. In addition the aggregate is proportioned as in the 831 DRYER but the drying process is eliminated, for in this setup water is required to help spread the clay particles through the mix and also to make the finished mix wet enough to compact well when rolled.

Before going into detail about the various mixtures and the setting of the machines to handle these mixtures, let us familiarize ourselves with the machines by following the action of the materials as they pass through, step by step.

THE BITUMINOUS PLANT



Let us begin the description of the Bituminous plant by following the flow of the aggregates. The plant can combine two different sizes of aggregate in the right proportion. Or, if only one size is available which contains proper quantities of sand and gravel to work satisfactorily, simply use it instead. We shall refer in this discussion to two sizes, although one size, such as a bank run gravel containing sand, could be used alone.

The sand and gravel aggregates are stockpiled in front of the 831 portable bucket Elevator which charges the hopper of the 831 DRYER. This elevator has two bucket lines for the separate handling of two sizes. Men with shovels feed the aggregates into the buckets, being assisted by other men operating power controlled drag scoops which pull in the material.

The aggregates are then picked up by the buckets and dumped into the divided hopper. This two-bin hopper has a plate feeder for a base which

feeds material through twin measuring gates into the DRYER drum.

This action is uniform, resulting in a controlled, measured feed of material. The gates are independently controlled so that different amounts of each material can be fed from the two hoppers at the same time, allowing proportioning.

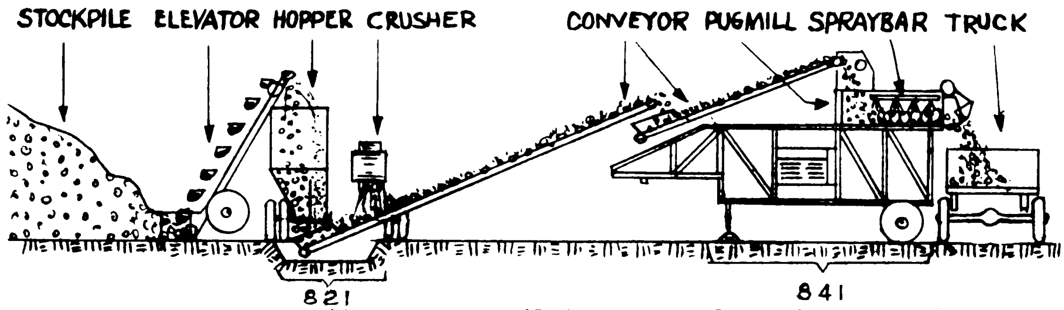
The large cylindrical DRYER drum rotates slowly, being tilted on a slight angle downward from the hopper end so the aggregate will pass through. Inside of the drum, cupped flights are bolted so that when the drum rotates, the material will be picked up from the bottom of the drum and let fall through the flame and hot gases from the burner. In this way the moisture is carried off, and by the time the material has passed completely through the drum, it has been heated and dried. The prepared and proportioned aggregates then drop out through the discharge chute onto the 341 MIXER transfer belt conveyor.

Before going farther with the aggregate let us look at the heating system of the DRYER. The drum is heated by an air-oil atomized flame from the burner. Air is furnished by a blower unit on which an oil pump is mounted to pump oil from a storage tank. An exhauster fan underneath the stack pulls the low pressure flame through the drum and out the exhaust stack.

The hot, dried aggregate, after passing through the discharge chute is carried up and dumped into the twin shaft pugmill by the belt conveyor. As it falls into the pugmill it is sprayed with bitumen from a nozzle in the spraybar. This bitumen is furnished by a metering pump which delivers a constant flow to the spraybar from the storage tank on the mixer.
The aggregate and bitumen are then mixed thoroughly together in the pugmill by the action of the rotating paddles on the twin shafts which gradually pass the material through the mill and discharge it through a gate into a truck ready for use.

Thus we see that in the 831 DRYER the aggregates are proportioned and dried; then in the 841 MIXER bitumen is added and the materials are mixed thoroughly together.

THE SOIL-AGGREGATE PLANT



To simplify the description of the Soil-Aggregate plant, let us again follow the flow of the aggregates through the machines. Remember in this case as in the bituminous setup, the plant is constructed to combine two different sizes of aggregate and clay soil but if one size of aggregate is available which will serve satisfactorily simply use it in both sides of the hopper.

The sand and gravel aggregates are stock piled in front of the 831 portable bucket Elevator which is used to charge the hopper of the 821 SOIL PREPARATION UNIT.

The filling of this hopper is accomplished in the same manner as in the bituminous setup through the use of men with shovels and the power drag-scoops. This is a divided hopper similiar to the DRYER hopper, having a reciprocating plate feeder as a base which feeds material out through the twin gates. From here the aggregate falls directly onto the 841 MIXER belt conveyor.

In addition to proportioning the sand and gravel, the 821 SOIL PREPARATION UNIT also measures the clay and pulverizes it so it can be mixed. The clay is shoveled into a small hopper which has a bar-chain feeder on the bottom of it to feed the clay out through a controllable gate onto a small conveyor which elevates the clay and drops it into a roll-crusher. These rolls crush and pulverize the clay lumps which fall onto the 841 MIXER belt conveyor on top of the sand and gravel. (See Diagram)

The prepared and proportioned clay, sand, and gravel then are carried together up to the pugmill and dumped in as before. As the paddles mix the materials together, water is added as required to spread the clay uniformly throughout and to get the correct amount of moisture in the mix, so that when it is spread and rolled it will compact to a dense mixture. This requires a mix which is moist enough to hold together but at the same time not be sloppy. The water is pumped through spray-bars over the pugmill by a centrifugal water pump, but the amount added is controlled by hand valves.

Thus we see that in the 821 SOIL PREPARATION UNIT, the aggregates are proportioned and the soil is measured and prepared; then in the 841 MIXER, water is added, and the materials are mixed together to get a uniform, homogeneous mixture.

CONSTRUCTION INFORMATION

CONTENTS

GENERAL PLAN

The purpose of this section is to give the reader enough information about materials, mixtures and methods necessary to the operation of the plant. Additional information can be obtained from other sources, one of which is the American Society for Testing Materials Handbook, giving general information. A Barber-Greene book, entitled "Materials and Methods for Military Airport Construction", was prepared especially for the construction of airports, but it gives a good background of definitions, principles, specifications and terminology of the various materials and types of mixes necessary for complete understanding.

Since it is assumed that these plants will be operating in restricted areas where supplies of aggregate are limited as to quality or amount and the choice and amount of bituminous material is probably determined by the source, there is usually little choice left in selecting the type of mix, but rather it becomes a matter of making the best possible use of whatever is available. Therefore, the discussion which follows will be general information on one general type of mix, using the most commonly found aggregates in practically the same proportions in both plants with whatever clay soil or bituminous material is available, and explaining the mechanical setting of the gates and pumps to produce this mixture.

Additional information is also included so that the operator will be able to judge whether the mixture he is obtaining is satisfactory.

AGGREGATE SELECTION FOR BOTH BITUMINOUS AND SOIL-AGGREGATE MIXES

DESCRIPTION OF IDEAL GRADATION OF AGGREGATES

This discussion treats with general information about aggregates which is pertinent to both the Bituminous Plant and the Soil Aggregate Plant. A successful mix depends in great part upon the proper selection and combining of the various aggregates in the correct proportions. A cross section of an ideal mix would show a dense mixture of various sized particles with the spaces or voids between the interlocking larger particles filled with the next smaller sizes, and those particles filled with the next smaller sizes, and so on down until finally the very small voids are filled with dust. This means a dense mix of high stability which will strongly resist displacement.

This progressive sizing is referred to as a well-graded aggregate. A well-graded aggregate may have a maximum particle size of 1-1/2 inches, 3/4 inch, or even 1/8 inch which is known as coarse sand. The stability of the aggregate mixture is not dependent upon the size of the largest particle but rather upon the progressive grading of the large particle down to dust. If there is a predominance of single size particles (whether they are 1/2" particles or 1/8" particles) the aggregate will lack stability because those same sized particles will roll and slip on each other, not having sufficient keying material to lock them in place. The only exception to this is in the case of crushed rock where there are enough flat sharp surfaces to cause a mechanical interlocking.

It should be noted here, that the maximum size of material selected has a practical limitation. The thickness of the pavement or mat to be placed determines this limitation. A good general rule to follow is to allow no particles in the mix greater than one-half the thickness of the pavement being laid. In other words, if the pavement is a two inch course, the largest sized aggregate should not exceed one inch in diameter, preferably not more than three-fourths inch in diameter; likewise if it is a four inch course, the maximum size should not exceed two inches in diameter.

This limitation is desirable to produce a durable pavement, for if one particle extended thru the complete thickness of the mat, it would be difficult to key it in with the rest of the mix and it would soon loosen and come out, resulting in the pavement breaking up at that point.

PRACTICAL SELECTION OF AGGREGATES

From the discussion of the importance of gradation it would seem that the only way to design a stable mix would be to have an elaborate screening set up. However, the plant engineers and operators of these mixing plants do not have the time or equipment to obtain this exact gradation and furthermore do not have even the necessary aggregates to use for such a gradation.

In view of this it is necessary to establish procedures which will give approximately the requirements of a stable mix. In general, it is wise to have 50% of total aggregate pass a #4 screen and 50% retained on a #4 screen. (A #4 screen will pass particles about 3/16" or less in diameter and the passed product is commerically known as sand). This means that whenever possible, use a combination of coarse and fine aggregates. A sufficient quantity of coarser particles in the mix helps build up stability, even though the grading may not be ideal. In other words the aggregate mixture is safer for desired stability. There should be a sufficient quantity of larger size particles above sand to actually contact and inter-lock each other or else those particles are merely floating in a sand mix and the stability is again entirely dependent upon the stability of the sand itself.

In many sections there is available bank run gravel, containing a mixture of gravel and sand, which is ideal after removing large oversized stone. Again you can be guided by how well the bank stands up when excavating the face. On the other hand, many bank run gravels are predominately sand. If crushing equipment is available, the larger pieces of gravel can sometimes be crushed down to balance out the percentage and the angular particles created by crushing will also help to increase stability of the aggregate. Where it is difficult to process the bank run gravel or where no such gravel is available, a good mixture can be obtained by combining crushed stone with sand.

Mixes which are 100% sand (passing a #4 screen) are the most tricky to handle since it is difficult to establish and insure good stability. Their stability again depends upon the proper grading within and the sharpness of the sand particles. This proper condition is difficult to judge by eye. An improperly graded sand mat tends to shove and rut under load and will squash out under the roller.

Yet sand is the only readily available aggregate in many sections of the world. Also there is nothing better than a good sand mix when properly graded. The safest sand is usually a bank sand dug out in its natural state. A bank sand which does not contain much clay, but stands up at a steep angle in the bank indicates that it has good stability. A river sand and lake or shore sand, on the other hand, is usually lacking in certain size particles which harms its stability. In commercial paving practice, these various sands are blended together to obtain a good overall grading. This might be done as a last resort. Moisten your sand sample and see how well it compacts. This will help as a guide.

In Soil Aggregate Mixes it is necessary to use aggregate that varies in size from coarse to fine to produce a dense mixture so that the mix will hold together in dry weather. For this reason sands are not suitable for Soil Aggregate Mixes since sand does not have sufficient variation in sizes to produce required stability.

Procedure to Follow in Proportioning Aggregates

After the available aggregates have been located it is first necessary to determine the approximate grading. This involves only the separation of several average samples of the same aggregate, into two groups with a #4 hand screen. If this separation is or near a 50-50 split, then the single aggregate will suffice and for all practical purposes will produce a stable mix.

In case the separation is such that there is a preponderance of either under or over the #4 screen, then it is desirable to look for an additional aggregate that will combine to give an approximate 50-50 split. That is, if #1 aggregate is mostly sand, then #2 aggregate should be selected such that it contains more over #4 than under #4 (or all over #4) in order to combine together to form a 50-50 split. If no other materials are available, then of course, the aggregate will have to be used as is, after exhausting any possibilities discussed earlier such as crushing etc.

If two aggregates are to be used, then the following formula can be used to ascertain the proportions of each aggregate. Since these proportions are almost infinite in number, only a selected few have been used in making up practical tables. After determining the calculated proportions, the nearest ratio group is used in the mixing tables. See mixing tables numbers 7, 8, 9, & 10 under Bituminous Mixes and table number 14 under Soil-Aggregate Mixes.

Formula for solving for proportions of two aggregates to give an approximate 50-50 split over and under #4:

$$x = \frac{100(b_2-a_2)}{(a_1-a_2-b_1+b_2)}$$

Where x = Percent of #1 Aggregate
$100-x$ = Percent of #2 Aggregate
a_1 = Percent of #1 Aggregate Under #4
b_1 = Percent of #1 Aggregate Over #4
a_2 = Percent of #2 Aggregate Under #4
b_2 = Percent of #2 Aggregate Over #4

Examples to illustrate how the formula is used:

No. 1 Given: #1 Aggregate $a_1 = 75\%$ Under #4
$b_1 = 25\%$ Over #4

#2 Aggregate a $a_2 = 10\%$ Under #4
$b_2 = 90\%$ Over #4

Substituting, $x = \frac{100(90-10)}{(75-10-25+90)} = 61.5\%$ of #1 Aggregate

$100-x =$ 38.5% of #2 Aggregate

$\therefore$ Use table listed under <u>60-40</u> division of two aggregates.

(Continued on next page)

No. 2 Given: #1 Aggregate $a_1 = 20\%$ Under #4
$b_1 = 80\%$ Over #4

#2 Aggregate $a_2 = 80\%$ Under #4
$b_2 = 20\%$ Over #4

Substituting, $x = \dfrac{100(20-80)}{(20-80-80+20)} = \underline{50\%}$ of #1 Aggregate

$100-x = \underline{50\%}$ of #2 Aggregate

$\therefore$ Use table listed under <u>50-50</u> division of two aggregates.

No. 3 Given: #1 Aggregate $a_1 = 20\%$ Under #4
$b_1 = 80\%$ Over #4

#2 Aggregate $a_2 = 100\%$ Under #4
$b_2 = 0\%$ Over #4

Substituting, $x = \dfrac{100(0-100)}{(20-100-80+0)} = 62.5\%$ of #1 Aggregate

$100-x = 37.5\%$ of #2 Aggregate

$\therefore$ Use table listed under 60-40 division of two aggregates.

AGGREGATES COMBINED WITH BITUMINOUS MATERIALS

WHERE AND WHEN USED

Aggregate is combined with bituminous materials (asphalts, tars) to produce bituminous paving material which when properly placed, produces an abrasion resistant, weatherproof, traffic surface.

A bituminous mix is relatively simple and easy to mix and handle, and since it can be opened to traffic soon after it is placed, it makes a good patching material for repairing pot holes, washouts, shell holes, etc. in existing pavement. The flexibility and stickiness of bituminous mixes at the time of laying helps the patch to secure a tight joint with the old pavement when the pavement is dry.

When patching, it is well to repair with a mixture which compares reasonably well with the old pavement. Try to use aggregate which approximates the same sizing and lay about the same thickness of mat. Ordinarily a bituminous mixture is used only to take the abrasion of traffic and to weatherproof the surface. The load is transferred thru the bituminous pavement into the base and the life or adequacy of the top pavement depends upon the stability of the base.

DISCUSSION OF ASPHALTS AND TARS

Bituminous materials are of two general classifications, asphalts and tars. These in turn are divided into different types which possess distinctive qualities that require different handling. Therefore, this section will attempt to give enough information about the various asphalts and tars so that they may be used in the Mixer.

R C Asphalts

R C asphalts consist of asphalt cement to which naphtha has been added. This is known as "cutting back", hence the common name of "R C cutback". The highly volatile naphtha is added to make the asphalt fluid, the degree of fluidity, depending upon how much naptha is added. Then when mixed with the aggregate and placed and allowed to aerate, the naphtha evaporates, leaving the asphalt behind. The amount of heat required to make an R C fluid enough to mix, depends upon the quantity of naphtha present.

R C asphalts are sub-divided principally on the basis of the naphtha content, being numbered from R C - 0 to R C - 5; the lower the number, the greater the naphtha content. See Table below.

The letters "R C" stand for "rapid curing" which refers to the short time it takes for the naphtha to evaporate, ie. for the asphalt to "cure". This time, of course, will depend upon how much naphtha is present, so that the R C's containing the most naphtha will require a longer period of time before the mix hardens or sets up, than do the R C's containing only a small amount of naphtha. It is important to allow naphtha to evaporate before rolling, otherwise a hard shell surface with soft interior may result.

DANGER! When using R C's it is important to remember that the naphtha is highly volatile and inflammable therefore, caution should be taken to keep all flames away and also not to heat the aggregate excessively. Always keep the aggregate temperatures down to 200° or under. See Bituminous Plant Operation Under Dryer.

Below is a table listing the R C's, giving the naphtha content and heating temperature

	Naphtha Content By Volume	Lowest Temperature for Pumping	Highest Temperature Without Injuring Bitumen	Average Temperature for Mixing
R C 1	40%	80° F.	125° F.	100° F.
R C 2	33%	100° F.	160° F.	135° F.
R C 3	27%	120° F.	175° F.	150° F.
R C 4	22%	145° F.	200° F.	175° F.
R C 5	18%	160° F.	225° F.	200° F.

Table #1

M C Asphalts

M C asphalts consist of asphalt to which has been added kerosene. The principle is much the same as for R C's except that kerosene is not so volatile as naphtha therefore it takes longer to evaporate and so is known as "M C" or "medium curing". Heat is also required for M C's in much the same manner and the same care should be taken not to allow any flame near the asphalt and not to heat aggregate too much over 200°. See Bituminous Plant Operation Under Dryer. Below is a table of the M C's giving % kerosene and heating temperature.

	Kerosene Content By Volume	Lowest Temperature for Pumping	Highest Temperature Without Injuring Bitumen	Average Temperature for Mixing
M C 1	40%	50° F.	150° F.	100° F.
M C 2	33%	125° F.	200° F.	156° F.
M C 3	27%	140° F.	230° F.	190° F.
M C 4	22%	140° F.	230° F.	190° F.
M C 5	18%	160° F.	250° F.	210° F.

Table #2

S C Asphalts

S C asphalts consist of asphalts containing light oils which are added to the asphalt to make them fluid or semi-solid. The asphalt is very slow in curing or hardening, thus the name "slow curing" or "S C". Heat is required to make them fluid enough for mixing as given on the chart below.

	Lowest Temperature for Pumping	Highest Temperature Without Injuring Bitumen	Average Temperature for Mixing
S C 1	80° F.	150° F.	110° F.
S C 2	120° F.	200° F.	175° F.
S C 3	150° F.	250° F.	200° F.
S C 4	170° F.	275° F.	225° F.
S C 5 to 7	170° F.	275° F.	240°F.

Table #3

A C Asphalts

This plant needs additional equipment to handle A C asphalts since they require a large supply of steam heat. However, the lines, pumps, and pug-mill are jacketed so that if steam is available they may be piped up and connected to a boiler for steam heating, in which case A C can be handled.

A C asphalts consist of refined petroleum asphalts or native Bermuda or Trinidad asphalts. The A C's are sub-divided into several classes according to the hardness of the different types. When using A C's it is necessary to have plenty of heat available for they must be kept very hot to make them fluid enough for mixing and to keep them from freezing in the lines and pumps. Below is a chart of temperatures for heating A C.

	Lowest Temperature for Pumping	Highest Temperature Without Injuring Bitumen	Average Temperature for Mixing
All A C's	250° F.	340° F.	280° F.

Table #4

Emulsified Asphalts

Emulsified asphalt consists of small particles of asphalt suspended in water in emulsion form. When mixed and placed the emulsion "breaks" and the water evaporates leaving the asphalt behind. Emulsions are designed to "break" after a time interval on being exposed to the atmosphere, although there are other factors to be considered which may cause premature breaking. Heat should not be used on the emulsion; also the emulsion should be handled carefully so that it will not "break" prematurely. Sometimes the strainer screen or the spray nozzle may cause it to "break", in which case they should be removed. When mixing emsulions, it is not necessary or desirable to dry the aggregate, the aggregate should be run through the Dryer with the burner shut off. If there is more than 4% moisture present in the aggregate, it might have to be dried but then must be allowed to cool to atmospheric temperature before emulsion can be added.

EMULSIONS

Type of Emulsion	Per cent of Water by Volume	Temp. Range *
EA-3	40-45	60-120
EA-4	35-40	60-110
EA-5	35	60-110

* Do Not Heat Artificially

Table #5

Tars

Road tars consist of mixtures of tar from coke oven and from the manufacture of illuminating gas. These mixtures produce different blends which are classified principally in regard to Viscosity. Heat is required to make them fluid enough for mixing as given in the table below.

	Lowest Temperature for Pumping	Highest Temperature Without Injuring Bitumen	Average Temperature for Mixing
R T 4	70° F.	160° F.	135° F.
R T 5	85° F.	175° F.	145° F.
R T 6	100° F.	180° F.	150° F.
R T 7	130° F.	250° F.	200° F.
R T 8	140° F.	250° F.	200° F.
R T 9	150° F.	250° F.	200° F.
R T 10	175° F.	275° F.	225° F.
R T 11	175° F.	275° F.	235° F.
R T 12	175° F.	275° F.	245° F.

Table #6

SETTING UP THE MIX

General Assumptions

A successful bituminous mix depends upon the proper measurement of the aggregate and bitumen in definite quantities and the proper mixing of the two in the pugmill. The percentages should vary for different asphalts and different aggregates. In accurate commercial practice, these percentages would be determined by extensive laboratory tests and by formulas based upon past experience. The percentage of asphalt would also be varied according to the type of service required of the final pavement.

However, it is realized that this plant will be used where there is no laboratory, very little experience, and no time to make elaborate calculations. Therefore, average conditions have been assumed and the feeder gate openings and pump speeds charted accordingly for different aggregates and different asphalts. The settings can be picked off of these charts for the initial set-ups. As the individual operator's experience grows, he might want to change the chart settings to better meet the specific conditions. Therefore, the pump capacities, weights of asphalts and asphalt temperature correction factors are listed after the mixing in case the operator should want to actually figure his percentages from scratch.

Per Cent Bitumen in Mix

The Table is based on certain basic assumptions as follows:

4-1/2% bitumen content has been assumed as average for a graded or filled aggregate. By 4-1/2% bitumen it is meant the % of active bituminous material, so that in the case of asphaltic mixtures such as emulsions or cutbacks, this percentage is the resultant bituminous material after the volatiles have evaporated. Therefore, when using cutbacks or emulsions, it is necessary to add an extra amount in proportion to the amount of volatile material in the mixture.

The following example will further explain this:

Using an RC4 which from the RC Table shows a naphtha content of 22%. The metering pump will then have to pump,

$$100 \times \frac{\text{Calculated Gal. per min. (at applied temperature)}}{100-22} =$$

Total gal. per min. to furnish the required amount of actual gallons of asphalt cement.

Since the pump output is varied by a series of change sprockets (see table #11), this total gallon figure must be readjusted to suit the nearest tabular capacity. Using the same example:

$$\text{Pump tabular reading gal. per min} \times \left(\frac{100-22}{100}\right) =$$

Total gal. per min. of actual asphalt cement available in the total gal. per min. handled by the metering pump.

Note that these calculations only apply to RC's & MC's asphalts. The same idea applies to Emulsions because here the equivalent "cut back" is water. AC's, SC's and RT's are all figured as straight bitumens.

Note also that a 100% sand mix requires 5% bitumen. This is necessary because of the greatly increased surface area to be coated resulting from the samll particles.

4-1/2% bitumen is purposely on the lean side. If a mix is too rich it shoves, ruts, and lacks stability, and there is little that can be done to help the condition after laying. With an open aggregate (not filled) this 4-1/2% may go to the rich side and with such an aggregate it would be wise to increase the gate openings somewhat.

On the other hand, a lean mix has good stability. If it turns out to be so lean that traffic has a tendency to ravel the surface, a spray of asphalt and sand can always be applied to the surface to resist the abrasion. Normally this will not be necessary unless the surface is used a year or more.

Weight of Aggregate: The weight of the aggregate has been assumed at 100 lbs. per cu. ft. loose. This is a good average weight although some variation can be expected. With the average mix figured on the lean side and with aggregate being measured by volume, this variation should not be serious.

Gate Openings: The gate openings have been calibrated and the table set up for the measurement of aggregate under average conditions. The measurement of sand under the same gate opening might vary with different percentages of moisture. As the operator becomes more experienced he can adjust the gates to improve the appearance of the mix under certain conditions. Where large truck scales are available, it is simple to check gate openings by the following method.

Checking the Gate Openings

Set the aggregate feeder gates at 2" opening and start up the plant without using the metering pump on the mixer or the burner on the dryer. Allow the aggregate to continuously run and discharge from the pugmill until the flow is uniform thru the pugmill. This is usually about one or two minutes after the material gets to the pugmill. The discharged material should be caught in a waiting truck and then redumped in the stockpile at the load-

ing elevator. After the flow is uniform, stop the operations, place an empty truck at the discharge, and then simultaneously resume operations, timing by watch the time to load the truck (or partially load, have at least a cubic yard). Check the time on stopping the plant operations and then weigh the truck load of gravel. The weight of the aggregate will be this gross weight less the weight of the empty truck. Note Be sure that engines are running at full operating speeds during these test runs.

$$\text{Then, } \frac{\text{lbs of aggregate run}}{2 \times \text{min. of operation}} = \text{lbs. per. min. at each of two gates for 2'' gate opening}$$

Repeat the operation for 6" of gate openings. Caution: Be sure that the plant is operating long enough for the aggregate from the 6" gates to flow thru the pugmill before catching a sample. Otherwise, the 2" gate settings might influence this second reading.

With these two capacities, the lbs. per min. at any other gate opening may be estimated readily by interpolating or by graphing on paper a straight line thru these two points.

Empty the dryer and mixer and dump the aggregate back on the stock pile.

Mixing Capacity: The chart is set up for two mixing capacities - 25 tons per hour and 20 tons per hour. The selection dpeends mainly upon two factors - (1) how wet is the aggregate and (2) how hot should the aggregate be dried to mix with the particular asphalt. Experience will help the operator to judge the conditions and select the proper capacity. Generally speaking, it is better to start with the lower capacity and then step capacity up when it appears practical.

Using the Mixing Tables: To use the tables it is necessary to know what kind of asphalt is to be used and the approximate classification of the aggregate.

The tables are divided vertically as to type of aggregate and horizontally as to kind of asphalt. Note that an all-sand mix will require an additional 1/2% of bitumen. Under the aggregate columns are found the gate openings in inches and the amount of material which will be fed by this opening in cubic feet per minute. On the same line with the asphalt is found the correct temperature for mixing, the gallons of asphalt to be supplied to produce the mix, and the sprockets to be used on the Kinney pump to produce this correct amount of asphalt.

To go through an example, suppose MC-4 is to be mixed with a combination of two aggregates in the "40-60" range and it is decided to use the 20 T.P.H. capacity chart; therefore, locking at the chart - we see that the 47T drive sprocket and the 35-tooth pump sprocket should be used. Following across the same line we see that under the proper aggregate column the #1 gate should be opened 2.88" to deliver 2.61 cubic feet per minute and the #2 gate should be opened 4.30" to deliver 3.91 cubic feet per minute. Next to the asphalt is the applied temperature reading of 190°F.

Therefore, we have all the information necessary to set the machines, which are the gate openings and the pump sprockets and temperature of bitumen. After operation begins an experienced operator can judge whether further adjustment is necessary.

Feeder Data
9" Wide x 6" stroke
48.6 Stroke per minute
* Capacity computed on 60% efficiency
** Capacity computed on 52% efficiency
*** Capacity computed on 65% efficiency

Bituminous Mixes - Single Aggregate - Various Bitumens

TOTAL CAPACITY 20 TONS PER HOUR OF MIX

Aggregate assumed to weigh 100# Per Cu. ft.

Table 7
831-841

5% Bitumen (By Weight) % = Bitumen / Bitumen plus aggregate									4½% Bitumen (By Weight) % = # Bitumen / # Bitumen plus # aggregate										
Sand aggregates not less than 90% passing #4 Screen				Pump Setting					Pump Setting			All Crushed Aggregate				‡Aggregate split approximately 50-50 above and below #4 Screen			
#1 Gate		#2 Gate		Sprockets		Gal. of Bitumen Per Min.	TYPE OF BITUMEN MATERIAL	APPLIED TEMP. DEGREE F.	Gal. of Bitumen Per Min.	Sprockets		#1 Gate		#2 Gate		#1 Gate		#2 Gate	
Cu. Ft. Per Min.	*** Inch Gate Open.	Cu.Ft. Per Min.	*** Inch Gate Open.	Driver	Pump					Driver	Pump	Cu. Ft. Per Min.	In.** Gate Open.	Cu. Ft. Per Min.	Inch** Gate Open.	Cu. Ft. Per Min.	Inch * Gate Open.	Cu. Ft. Per Min.	Inch* Gate Open.
3.06	3.10	3.06	3.10	47	32	6.23	RC 2	135	5.64	47	35	3.09	3.91	3.09	3.91	3.09	3.40	3.09	3.40
3.04	3.08	3.04	3.08	47	35	5.64	RC 3	150	5.00	47	39	3.01	3.81	3.01	3.81	3.01	3.30	3.01	3.30
3.24	3.28	3.24	3.28	47	35	5.64	RC 4	175	5.00	47	39	3.21	4.06	3.21	4.06	3.21	3.53	3.21	3.53
3.03	3.07	3.03	3.07	47	39	5.00	RC 5	200	4.50	47	43	3.04	3.85	3.04	3.85	3.04	3.34	3.04	3.34
3.09	3.13	3.09	3.13	47	32	6.23	MC 2	165	5.64	47	35	3.12	3.95	3.12	3.95	3.12	3.43	3.12	3.43
3.06	3.10	3.06	3.10	47	35	5.64	MC 3	190	5.00	47	39	3.02	3.82	3.02	3.82	3.02	3.32	3.02	3.32
3.30	3.34	3.30	3.34	47	35	5.64	MC 4	190	5.00	47	39	3.26	4.13	3.26	4.13	3.26	3.58	3.26	3.58
3.08	3.12	3.08	3.12	47	39	5.00	MC 5	210	4.50	47	43	3.09	3.91	3.09	3.91	3.09	3.40	3.09	3.40
3.05	3.09	3.05	3.09	47	47	4.08	SC 4	225	3.67	29	32	3.06	3.88	3.06	3.88	3.06	3.37	3.06	3.37
3.06	3.10	3.06	3.10	47	47	4.08	SC 5	240	3.67	29	32	3.08	3.90	3.08	3.90	3.08	3.38	3.08	3.38
3.06	3.10	3.06	3.10	47	47	4.08	SC 6	240	3.67	29	32	3.08	3.90	3.08	3.90	3.08	3.38	3.08	3.38
3.06	3.10	3.06	3.10	47	47	4.08	SC 7	240	3.67	29	32	3.08	3.90	3.08	3.90	3.08	3.38	3.08	3.38
3.16	3.20	3.16	3.20	47	29	6.93	EA 3	† †	6.23	47	32	3.17	4.02	3.17	4.02	3.17	3.49	3.17	3.49
3.09	3.13	3.09	3.13	47	32	6.23	EA 4	† †	5.64	47	35	3.12	3.95	3.12	3.95	3.12	3.43	3.12	3.43
3.21	3.25	3.21	3.25	47	32	6.23	EA 5	† †	5.64	47	35	3.31	4.19	3.31	4.19	3.31	3.64	3.31	3.64
3.30	3.34	3.30	3.34	29	32	3.67	RT 4	135	3.30	29	35	3.31	4.19	3.31	4.19	3.31	3.64	3.31	3.64
3.31	3.35	3.31	3.35	29	32	3.67	RT 5	145	3.30	29	35	3.32	4.20	3.32	4.20	3.32	3.66	3.32	3.66
3.34	3.38	3.34	3.38	29	32	3.67	RT 6	150	3.30	29	35	3.34	4.23	3.34	4.23	3.34	3.68	3.34	3.68
3.30	3.34	3.30	3.34	29	32	3.67	RT 7	200	3.30	29	35	3.32	4.20	3.32	4.20	3.32	3.65	3.32	3.65

‡ Use this table for aggregate split other than 50-50 if only one aggregate is available

† † Do Not Heat Artificially

Feeder Data
9" Wide x 6" Stroke
48.6 Strokes per Min.
* Capacity computed on
60% efficiency

Table 8
831-841

Bituminous Mixes - Two Aggregate - Various Bitumens

TOTAL CAPACITY 20 TONS PER HOUR OF MIX

Combination of Aggregates to give approximately 50-50 split above & below #4 Screen. Aggregates assumed to weigh 100# per cu. ft.

$4\frac{1}{2}$% BITUMEN (By Weight) $\% = \frac{\text{Bitumen}}{\text{Bitumen + Aggregates}}$

			PUMP SETTING		20% #1 AGGREGATE		80% #2 AGGREGATE		30% #1 AGGREGATE		70% #2 AGGREGATE		40% #1 AGGREGATE		60% #2 AGGREGATE		50% #1 AGGREGATE		50% #2 AGGREGATE	
Type Of Bit.	Applied Temp. Deg. F.	Gal. of Bitumen per Min.	SPROCKETS Driver	SPROCKETS Pump	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open
RC 2	135	6.23	47	32	1.24	1.36	4.95	5.44	1.86	2.04	4.33	4.76	2.47	2.72	3.71	4.08	3.09	3.40	3.09	3.40
RC 3	150	5.64	47	35	1.20	1.32	4.81	5.28	1.80	1.98	4.21	4.62	2.40	2.64	3.61	3.96	3.01	3.30	3.01	3.30
RC 4	175	5.64	47	35	1.28	1.41	5.14	5.65	1.92	2.12	4.50	4.95	2.57	2.82	3.85	4.24	3.21	3.53	3.21	3.53
RC 5	200	5.00	47	39	1.22	1.34	4.86	5.35	1.82	2.01	4.26	4.68	2.43	2.68	3.65	4.01	3.04	3.34	3.04	3.34
Mc 2	165	6.23	47	32	1.25	1.37	4.99	5.49	1.87	2.06	4.37	4.81	2.50	2.75	3.74	4.12	312	3.43	3.12	3.43
MC 3	190	5.64	47	35	1.21	1.33	4.83	5.31	1.81	1.99	4.23	4.65	2.42	2.66	3.62	3.98	3.02	3.32	3.02	3.32
MC 4	190	5.64	47	35	1.30	1.43	5.22	5.74	1.96	2.15	4.56	5.02	2.61	2.88	3.91	4.30	3.26	3.58	3.26	3.58
MC 5	210	5.00	47	39	1.24	1.36	4.95	5.44	1.85	2.04	4.34	4.76	2.48	2.72	3.71	4.08	3.09	3.40	3.09	3.40
SC 4	225	4.08	47	47	1.23	1.35	4.90	5.39	1.84	2.02	4.29	4.72	2.45	2.70	3.68	4.05	3.06	3.37	3.06	3.37
SC 5	240	4.08	47	47	1.23	1.35	4.92	5.41	1.85	2.03	4.31	4.74	2.46	2.71	3.79	4.06	3.08	3.38	3.08	3.38
SC 6	240	4.08	47	47	1.23	1.35	4.92	5.41	1.85	2.03	4.31	4.74	2.46	2.71	3.79	4.06	3.08	3.38	3.08	3.38
SC 7	240	4.08	47	47	1.23	1.35	4.92	5.41	1.85	2.03	4.31	4.74	2.46	2.71	3.79	4.06	3.08	3.38	3.08	3.38
EA 3	++	6.93	47	29	1.27	1.40	5.07	5.58	1.90	2.09	4.44	4.88	2.54	2.80	3.80	4.18	3.17	3.49	3.17	3.49
EA 4	++	6.23	47	32	1.25	1.37	4.99	5.49	1.87	2.06	4.37	4.81	2.50	2.74	3.74	4.11	3.12	3.43	3.12	3.43
EA 5	++	6.23	47	32	1.32	1.46	5.30	5.82	1.99	2.18	4.63	5.10	2.65	2.92	3.97	4.37	3.31	3.64	3.31	3.64
RT 4	135	3.67	29	32	1.32	1.46	5.30	5.82	1.99	2.18	4.63	5.10	2.65	2.92	3.97	4.37	3.31	3.64	3.31	3.64
RT 5	145	3.67	29	32	1.33	1.46	5.32	5.85	2.00	2.20	4.65	5.11	2.66	2.92	3.99	4.39	3.32	3.66	3.32	3.66
RT 6	150	3.67	29	32	1.34	1.47	5.34	5.88	2.01	2.21	4.68	5.15	2.68	2.94	4.00	4.41	3.34	3.68	3.34	3.68
RT 7	200	3.67	29	32	1.33	1.46	5.31	5.84	1.99	2.19	4.64	5.11	2.66	2.92	3.98	4.38	3.32	3.65	3.32	3.65

++ Do Not Heat Artificially

Feeder Data
9" Wide x 6" Stroke
48.6 Strokes per min.
*Capacity computed on 60% Efficiency
** Capacity computed on 52% Effeciency
*** Capacity computed on 65% Effeciency

Bituminous Mixes - Single Aggregate - Various Bitumens

Table 9
831-841

TOTAL CAPACITY 25 TONS PER HOUR OF MIX

Aggregates assumed to weigh 100# per cu. ft.

5% Bitumen (By Weight) % = BITUMEN / Bitumen plus aggregate									4½% Bitumen (By Weight) % = Bitumen / Bitumen plus Aggregate										
Sand aggregates, not less than 90% passing #4 screen				Pump Setting					Pump Setting			All Crushed Aggregate				‡Aggregate split approximately 50-50 above and below #4 screen			
#1 Gate		#2 Gate		Sprockets						Sprockets		#1 Gate		#2 Gate		#1 Gate		#2 Gate	
Cu.Ft. Per Min.	*** Inch Gate Open.	Cu.Ft. Per Min.	*** Inch Gate Open.	Driver	Pump	Gal. of Bitumen Per Min.	TYPE OF BITUMEN	APPLIED TEMP. DEGREE F.	Gal. of Bitumen Per Min.	Driver	Pump	Cu.Ft. Per Min.	** In. Gate Open	Cu.Ft. Per Min.	** In. Gate Open	Cu.Ft. Per Min.	* In. Gate Open	Cu.Ft. Per Min.	* In. Gate Open
3.83	3.88	3.83	3.88	47	26	7.8	RC 2	135	6.93	47	29	3.80	4.80	3.80	4.80	3.80	4.17	3.80	4.17
3.73	3.78	3.73	3.78	47	29	6.93	RC 3	150	6.93	47	29	4.16	5.27	4.16	5.27	4.16	4.58	4.16	4.58
3.99	4.04	3.99	4.04	47	29	6.93	RC 4	175	6.23	47	32	4.01	5.08	4.01	5.08	4.01	4.41	4.01	4.41
3.78	3.83	3.78	3.83	47	32	6.23	RC 5	200	5.64	47	35	3.81	4.82	3.81	4.82	3.81	4.19	3.81	4.19
3.88	3.93	3.88	3.93	47	26	7.8	MC 2	165	6.93	47	29	3.84	4.86	3.84	4.86	3.84	4.22	3.84	4.22
3.75	3.80	3.75	3.80	47	29	6.93	MC 3	190	6.23	47	32	3.76	4.76	3.76	4.76	3.76	4.13	3.76	4.13
4.05	4.11	4.05	4.11	47	29	6.93	MC 4	190	6.23	47	32	4.06	5.14	4.06	5.14	4.06	4.46	4.06	4.46
3.84	3.89	3.84	3.89	47	32	6.23	MC 5	210	5.64	47	35	3.88	4.91	3.88	4.91	3.88	4.27	3.88	4.27
3.74	3.79	3.74	3.79	47	39	5.00	SC 4	225	5.00	47	39	4.17	5.28	4.17	5.28	4.17	4.58	4.17	4.58
3.75	3.80	3.75	3.80	47	39	5.00	SC 5	240	4.50	47	43	3.73	4.73	3.73	4.73	3.73	4.10	3.73	4.10
3.75	3.80	3.75	3.80	47	39	5.00	SC 6	240	4.50	47	43	3.73	4.73	3.73	4.73	3.73	4.10	3.73	4.10
3.75	3.80	3.75	3.80	47	39	5.00	SC 7	240	4.50	47	43	3.73	4.73	3.73	4.73	3.73	4.10	3.73	4.10
3.87	3.92	3.87	3.92	47	24	8.5	EA 3	††	7.8	47	26	3.97	5.03	3.97	5.03	3.97	4.36	3.97	4.36
3.87	3.92	3.87	3.92	47	26	7.8	EA 4	††	6.93	47	29	3.83	4.85	3.83	4.85	3.83	4.21	3.83	4.21
4.02	4.07	4.02	4.07	47	26	7.8	EA 5	††	6.93	47	29	3.99	5.05	3.99	5005	3.99	4.39	3.99	4.39
4.05	4.11	4.05	4.11	47	43	4.50	RT 4	135	4.08	47	47	4.10	5.19	4.10	5.19	4.10	4.51	4.10	4.51
4.06	4.12	4.06	4.12	47	43	4.50	RT 5	145	4.08	47	47	4.11	5.20	4.11	5.20	4.11	4.52	4.11	4.52
4.09	4.15	4.09	4.15	47	43	4.50	RT 6	150	4.08	47	47	4.14	5.24	4.14	5.24	4.14	4.55	4.14	4.55
4.04	4.09	4.04	4.09	47	43	4.50	RT 7	200	4.08	47	47	4.10	5.20	4.10	5.20	4.10	4.50	4.10	4.50

‡ Use this table for aggregate split other than 50-50 if only one aggregate is available

†† Do not heat Artificially

Feeder Data: 9" Wide x 6" Stroke
48.6 Strokes per Min.
* Capacity computed on 60% efficiency

Table 10
831-841

Bituminous Mixes - Two Aggregate - Various Bitumens

TOTAL CAPACITY 25 TONS PER HOUR OF MIX

Combination of Aggregates to give approximately 50-50 split above & below #4 Screen Aggregates assumed to weigh 100# per cu. ft.

4½% BITUMEN (By Weight) % = Bitumen / (Bitumen + Aggregates)

PUMP SETTING					20% #1 AGGREGATE		80% #2 AGGREGATE		30% #1 AGGREGATE		70% #2 AGGREGATE		40% #1AGGREGATE		60% #2 AGGREGATE		50% #1 AGGREGATE		50% #2 AGGREGATE	
Type Of Bit.	Applied Temp. Deg. F.	Gal. of Bitumen per Min.	SPROCKETS Driver	SPROCKETS Pump	Cu.Ft. Per Min.	In.* Gate Open.	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open	Cu.Ft. Per Min.	In.* Gate Open
RC 2	135	7.8	47	26	1.52	1.67	6.08	6.68	2.28	2.51	5.32	5.84	3.04	3.34	4.56	5.01	3.80	4.17	3.80	4.17
RC 3	150	6.93	47	29	1.67	1.83	6.67	7.34	2.50	2.75	5.84	6.42	3.33	3.67	5.00	5.50	4.16	4.58	4.16	4.58
RC 4	175	6.93	47	29	1.60	1.76	6.42	7.05	2.40	2.64	5.62	6.17	3.21	3.53	4.81	5.29	4.01	4.41	4.01	4.41
RC 5	200	6.23	47	32	1.52	1.67	6.10	6.70	2.29	2.52	5.33	5.86	3.05	3.35	4.57	5.02	3.81	4.19	3.81	4.19
MC 2	165	7.8	47	26	1.53	1.68	6.14	6.75	2.30	2.53	5.37	5.90	3.07	3.37	4.60	5.06	3.84	4.22	3.84	4.22
MC 3	190	6.93	47	29	1.50	1.65	6.02	6.62	2.26	2.48	5.26	5.78	3.01	3.31	4.51	4.95	3.76	4.13	3.76	4.13
MC 4	190	6.93	47	29	1.62	1.78	6.50	7.15	2.44	2.68	5.68	6.24	3.25	3.57	4.87	5.35	4.06	4.46	4.06	4.46
MC 5	210	6.23	47	32	1.55	1.70	6.21	6.83	2.33	2.56	5.43	5.96	3.10	3.41	4.66	5.12	3.88	4.27	3.88	4.27
SC 4	225	5.00	47	39	1.67	1.83	6.67	7.33	2.50	2.75	5.84	6.42	3.34	3.67	5.00	5.50	4.17	4.58	4.17	4.58
SC 5	240	5.00	47	39	1.49	1.64	5.96	6.56	2.24	2.45	5.22	5.74	2.98	3.28	4.47	4.92	3.73	4.10	3.73	4.10
SC 6	240	5.00	47	39	1.49	1.64	5.96	6.56	2.24	2.45	5.22	5.74	2.98	3.28	4.47	4.92	3.73	4.10	3.73	4.10
SC 7	240	5.00	47	39	1.49	1.64	5.96	6.56	2.24	2.45	5.22	5.74	2.98	3.28	4.47	4.92	3.73	4.10	3.73	4.10
EA 3	† †	8.5	47	24	1.59	1.75	6.35	6.98	2.38	2.62	5.56	6.11	3.18	3.50	4.78	5.25	3.97	4.36	3.97	4.36
EA 4	† †	7.8	47	26	1.53	1.68	6.13	6.74	2.30	2.53	5.36	5.89	3.07	3.37	4.60	5.06	3.83	4.21	3.83	4.21
EA 5	† †	7.8	47	26	1.60	1.76	6.38	7.02	2.39	2.63	5.59	6.14	3.19	3.50	4.79	5.27	3.99	4.39	3.99	4.39
RT 4	135	4.50	47	43	1.64	1.80	6.56	7.21	2.46	2.70	5.74	6.30	3.28	3.60	4.92	5.40	4.10	4.51	4.10	4.51
RT 5	145	4.50	47	43	1.64	1.80	6.58	7.23	2.47	2.71	5.75	6.31	3.28	3.60	4.94	5.43	4.11	4.52	4.11	4.52
RT 6	150	4.50	47	43	1.66	1.82	6.62	7.28	2.48	2.72	5.80	6.37	3.32	3.65	4.96	5.45	4.14	4.55	4.14	4.55
RT 7	200	4.50	47	43	1.64	1.80	6.55	7.20	2.46	2.70	5.74	6.30	3.28	3.60	4.92	5.40	4.10	4.50	4.10	4.50

† † Do Not Heat Artificially

Judging The Mix

After the plant has been started, the operator should study the mix and judge whether it is satisfactory. Naturally he will be in a better position to do this after some experience in observing the results on the road. However, the following points will help guide him.

Proper Drying: This is discussed more fully under the operation of the dryer. The main purpose of drying is to obtain a good bond between the asphalt and the aggregate, because water on the aggregate particles harms this bond. This is particularly true on the hot A C asphalts. Fortunately, "cut back" asphalts will probably be supplied and a little moisture is not so harmful, however, dry aggregate is to be preferred (except Emulsions). The time to check this is as it leaves the dryer and not after it has been mixed.

Thorough Mixing: It is most important that <u>all</u> particles be coated. If the aggregate is <u>not</u> coated, then check into the following possible reasons: --

(a) Too much moisture in the aggregate. If the uncoated stone has a slippery wet appearance then you can be sure that the trouble lies in too much moisture. Increase flame in Dryer if possible -- otherwise reduce plant capacity.

(b) Insufficient heat on bitumen or aggregate. This condition becomes apparent when the asphalt film from the spray nozzle is sluggish together with a balling or concentration of asphalt in spots.

(c) Insufficient Mixing. Where there is a balling or concentration of asphalt and yet the asphalt seems to be fluid and workable, it probably means that there is not enough pressure in the pugmill to spread the asphalt over all particles. First, raise dam by turning wheel at pugmill discharge to raise level of material in pugmill and increase pressure. If this is not enough, then change paddle setting as descibed under Mixer operation. (Note: When first starting the mixer after it has been empty, the first part of the truck load may not be thoroughly coated because the pressure has not yet been built up sufficiently to get good coating. This portion can either be thrown away or used, depending upon its condition.)

(d) Insufficient asphalt. Where the film of asphalt seems to be too thin and there are uncoated particles, then the mix is too lean (does not contain enough asphalt). This is discussed under the next subject.

Proper Proportions: As previously discussed, the tables have been set up on the basis of general conditions with the asphalt percentage on the lean side. In operation with specific materials it may turn out to be too lean or too rich. To better judge this condition, we suggest the following procedure. Dig a small hole in the ground, 6 or 8 inches in diameter and put a shovel full of mix in the hole. Compact this sample thoroughly by foot, shovel, etc. If there is a tendency for surplus asphalt to rise to the surface, the mix is too rich. If, on the other hand, the sample has a very dry appearance, the mix is too lean. When handling cut-back asphalts, the flux in the asphalt has a tendency to make the mix appear richer than it actually is. After the flux evaporates, the appearance will change. This should be taken into consideration, as emulsion mix will also appear richer than it really is and will have a brownish color until the emulsion "breaks" and the water leaves. Observe the sample after a few days when it has set. Compare it to the results observed on the road. By thus studying the mix and operator will be able to better judge the proper proportions in the future.

If the operator decides the mix is too lean, lower the aggregate gates on the reciprocating feeder to cut down the percentage of aggregate to asphalt. If too rich, raise the gates, increasing the amount of aggregate.

<u>Remember in any mix it is always safer to be on the lean side than the rich side.</u>

MISCELLANEOUS DATA FOR CALCULATIONS

KINNEY PUMP CAPACITIES

29-T. Drive Sprocket		47-T. Drive Sprocket	
Pump Sprocket No. of Teeth	Bitumen Gals. per Min.	Pump Sprocket No. of Teeth	Bitumen Gals. Per Min.
24	5.02	24	8.5
26	4.59	26	7.8
29	4.08	29	6.93
32	3.67	32	6.23
35	3.30	35	5.64
39	2.91	39	5.00
43	2.59	43	4.50
47	2.32	47	4.08
52	2.07	52	3.64

Table #11

AVERAGE WEIGHTS OF VARIOUS BITUMENS

Type Bitumen	Lbs. per Gallon @ 60°	Applied Temperature Degree F.	Lbs. per Gallon @ Applied Temp.
RC 1	7.75	100	*7.64
RC 2	7.91	135	*7.70
RC 3	8.00	150	*7.75
RC 4	8.08	175	*7.76
RC 5	8.16	200	*7.77
MC 1	7.91	100	*7.80
MC 2	8.08	165	*7.79
MC 3	8.16	190	*7.80
MC 4	8.25	190	*7.88
MC 5	8.32	210	*7.90
SC 1	8.18	110	8.04
SC 2	8.25	175	7.92
SC 3	8.22	200	7.88
SC 4	8.33	225	7.86
SC 5 to 7	8.40	240	7.89
EA 3	8.33	No Heat	*8.33
EA 4	8.33	No Heat	*8.33
EA 5	8.33	No Heat	*8.33
RT 1	9.50	95	9.38
RT 2	9.56	100	9.43
RT 3	9.64	125	9.42
RT 4	9.71	135	9.46
RT 5	9.78	145	9.49
RT 6	9.85	150	9.55
RT 7	9.93	200	9.46
RT 8	10.00	200	9.52
RT 9	10.07	200	9.59
RT 10	10.15	225	9.58
RT 11	10.22	235	9.62
RT 12	10.30	245	9.66
All AC's	8.45	280	7.83

Table #12

*Make allowance for Solvent or water content in pump set-up calculations.

See "Per cent Bitumen in Mix"

DATA ON WEIGHT OF BITUMEN

All bitumens expand when heated and therefore, a given volume will weigh less at 300°F. than it will at 60°F. For this reason, it will be necessary to calculate the weight of the bitumen used at its specified applied temperature. Where the specific gravity or weight per gallon of a bitumen at 60°F. is known, the exact weight per gallon at the applied temperature can be calculated as outlined below.

Table for Determining the Weight or Volume of

Bitumens at Applied Temperatures

t = observed temperature °F.
M = conversion factor

t	M	t	M	t	M	t	M
60	1.000	135	.974	210	.949	285	.925
65	.998	140	.972	215	.947	290	.923
70	.997	145	.971	220	.946	295	.922
75	.995	150	.969	225	.944	300	.920
80	.993	155	.967	230	.943	305	.919
85	.991	160	.966	235	.941	310	.917
90	.990	165	.964	240	.939	315	.915
95	.988	170	.963	245	.938	320	.914
100	.986	175	.961	250	.936	325	.912
105	.984	180	.959	255	.934	330	.911
110	.983	185	.957	260	.933	335	.909
115	.981	190	.956	265	.931	340	.908
120	.979	195	.954	270	.930	345	.906
125	.978	200	.952	275	.928	350	.905
130	.976	205	.951	280	.926	355	.903

Formula

(1) $Vt = \frac{V_{60}}{M}$

(2) $Wt = W_{60} \times M$

VT = Volume at applied temperature, gallons
Wt = Weight at applied temperature, pounds
V_{60} = Volume at 60° F. gallons
W_{60} = Weight at 60° F. pounds

Example for Formula #1:
$\frac{1000 \text{ gal. at } 60^\circ \text{ F}}{.930 \text{ (for } 270^\circ \text{ F)}} = 1075.26$ gals. at 270° F.

Example for Formula #2:
8.32 lbs. per gal. at 60° F x .949 factor for 210° F = 7.90 lbs. per gal. at 210° F.

Weight of Bitumen Per Gallon from Specific Gravity

To obtain weight of a bitumen per gallon at 60° F. when the specific gravity at 60° F. is known, multiply the specific gravity by 8.33 lbs., the weight of water at 60° F. (Actual weight of water at 60° F. is 8.32828 and its specific gravity is 1.0)

For Example:

The sp. gr. at 60° F. of an asphalt cement is 1.011.
Then to find weight per gal. at 60° F:

1.011 x 8.33 lbs. - 8.42 lbs. per gal. at 60° F.

The following table gives weight per gallon from specific gravity:

Sp. Gr.	Lbs. Per Gal.	Sp. Gr.	Lbs. Per Gal.	Sp. Gr.	Lbs. Per Gal.	Sp. Gr.	Lbs. Per Gal.
0.880	7.329	0.930	7.745	0.980	8.162	1.030	8.578
0.885	7.370	0.935	7.786	0.985	8.203	1.035	8.620
0.890	7.412	0.940	7.828	0.990	8.245	1.040	8.662
0.895	7.453	0.945	7.870	0.995	8.287	1.045	8.704
0.900	7.495	0.950	7.911	1.000	8.328	1.050	8.745
0.905	7.536	0.955	7.953	1.005	8.370	1.055	8.787
0.910	7.578	0.960	7.995	1.010	8.412	1.100	9.161
0.915	7.619	0.965	8.036	1.015	8.453	1.200	9.994
0.920	7.662	0.970	8.078	1.020	8.495	1.300	10.826
0.925	7.703	0.975	8.120	1.025	8.537	1.400	11.659

AGGREGATE COMBINED WITH CLAY SOILS

WHERE AND WHEN USED

When properly graded aggregate is combined with correct proportions of clay soil and water, it will result in a mix, which when properly placed, produces a dense all-weather support capable of carrying heavy loads. Since no foreign binders such as asphalt are added but only natural aggregates and clay soils, this is an ideal mix for building up a load supporting base for the top eight or ten inches of a filled-in shell crater, washout, etc. However, it does not have the resistance to traffic abrasion that a bituminous pavement has, therefore it is often topped with a bituminous mat. If no bituminous material is available, it will serve satisfactorily except that it may require more maintenance and repair. Simple and easy to handle and mix, and utilizing materials which are commonly found in many places, the Soil Aggregate mix can be used extensively for repairing and road building.

DISCUSSION OF CLAY SOILS

Purpose of Clay Soils

The purpose of the clay soil is to supply clay to coat the particles of sand and graded gravel in the mix so that when the mix has the correct (or optimum) water content, the clay film will bind or hold these particles together when compacted. Even when dry, the combination of clay, silt, sand and coarse material contributes, thru mechanical friction, to stability and resistance to traffic and weather resistance. Enough clay is needed to act as a binder in dry weather and a stopper to capillary action in wet weather by virtue of its swelling action. Due to this latter action, too much clay causes excessive swelling making the mix unstable during wet weather.

Since clay soils vary greatly as to content and properties, it is advisable to consult textbooks on this subject for a more detailed technical discussion. However, for the purpose of this book, clay soils behave basically as discussed above and will be classified under two general classifications as follows:

Clay Soils Predominately Sand and Silt

Soils that are predominately sand and silt having a low clay content, are not well suited for soil aggregate construction because of the low binding qualities. The relatively small percentage of clay (which produces the binding) contained in the soil makes it necessary to add quite a sizable percentage to the mix. By taking a sample in the hand one can tell from its appearance or from its "feel" whether it contains much sand. Sandy soils will naturally be common near coastal or lake regions. To determine if the soil can be used, a sample might be moistened and rolled into a ball or mixed with some sand and gravel to see whether it contains enough clay to hold together. Usually if a small moistened sample of the soil is rolled between the palms it will be satisfactory if it will form a roll which will not break up until it is about the diameter of a common lead pencil.

Clay Soils Predominately Clay

Soils containing a high percentage of clay are well suited for soil aggregate construction. However, some of these clayey soils have different qualities which make some of them undesirable. An ordinary yellow clay soil not having an excessive clay content and which dries out in lumps that can be crushed into powder which readily absorbs water, is well suited for this work. Sticky, gumbo clays which retain much moisture and become slippery and very plastic when wet will be hard to handle and mix, since they will not pulverize or crush easily into fine particles which can be spread uniformly throughout the mix. Instead they will "pancake" as they pass through the crusher rolls into soft lumps which will not break up in the pugmill.

By examning a sample handful, one can determine approximately how well the clay will mix by working it with the fingers, possibly adding sand and gravel to see if it will hold them together successfully. Remember the percentage of soil content in the mix will vary according to the clay content of the soil.

SETTING UP THE MIX

General Description:

A successful soil aggregate mix depends upon the proper measurement of the aggregate and clay in definite graded quantities and the proper mixing of them together with water in the pugmill. The percentage of sizes of aggregate, clay, and water will vary for different soils and for different conditions. In actual commercial practice the aggregates would be measured and graded to see if correct amounts of different sizes were present and the soil would be tested as to clay content and amount of water required.

However, this plant will be operated where such tests cannot be made, therefore average conditions have been assumed and a table made up for the aggregate feeder gate openings and soil gate opening for different types of aggregates and the two general classifications of soils already discussed. In this way the operator can set the gates for the initial set ups, varying the gates or tabular values to meet specific conditions as his experience grows.

The table is based on certain basic assumptions as follows:

Per Cent Soil in Mix: The percentage of soil in the mix has been set at 12% for soils predominately clay and 20% for soils predominately sand or silt. These percentages serve as average values because the type and quanity of clay content in these general classifications of clay soils are bound to vary considerably.

Weight of Aggregates: The aggregate has been assumed to weigh 100 pounds per cubic foot loose. This will vary somewhat but not enough to be serious.

Weight of Clay Soils: The clay soils have also been assumed to weigh 100 pounds per cubic foot loose. The amount of moisture contained as well as the actual type and kind of soils used will necessarily cause this to vary but for practical purposes the assumed weight will give a reasonable average.

Moisture Content: A successful soil-aggregate mix depends greatly upon the correct amount of water present when mixed and laid The water serves two purposes: it helps to spread the particles of clay uniformly thruout the mix, and it controls the amount of compaction.

The exact amount of water to be added is not given in the table for several reasons. The probable optimum moisture content for the mix will vary approximately 6 to 9% for average aggregates used. Also, moisture is always present in appreciable amounts, although variable, in natural soils and aggregates and only enough water should be added to make up the balance required.

This make up water is controlled by the operator by means of hand valves at the spray bars and the amount is determined entirely by the judgment of this operator. Only enough water should be added to cause the clay to hold the particles together and this can be tested in a crude but practical way by testing a "hand" sample at the pugmill discharge. The sample should consolidate and compact into a solid ball by hand squeezing with out excess water forming on the surface of the ball.

It is important not to add too much water because the mix will not compact to the maximum density when layed. Additional water can always be added if more is needed and therefore, it is desirable to be on the "dry" side.

Gate Openings: The gates have been calibrated for different openings and the Table set up for the measurement of aggregate and soil under average conditions. Variations in moisture content of the aggregate may cause variations in the feeding especially in case of sand. If truck scales are available, it is simple to check gate openings by timing the mixing of a truck load and then weighing the load, similiar to the procedure outlined under "Gate Openings" in the Bituminous Mix Section. As the operator becomes experienced, he can adjust the gates to improve the mix simply by judging from the looks of the materials and the mix resulting.

Mixing Capacity: The mixing table is set up for two mixing capacities, 30 tons and 40 tons per hour. The selection depends upon the supply of soil and aggregate available and the ease of mixing. Usually it is better to start at the lower capacity and increase it if it appears practical. For capacities other than given all gate openings will be approximately proportioned to the tabular values.

CLAY-SOIL AGGREGATE MIXES

Aggregate or Combination of Two Aggregates to give approximately 50-50 split above & below #4 Screen

Table 14
821-841

Aggregate assumed to weigh 100# Per. Cu.Ft.
Clay-Soil assumed to weigh 100# Per. Cu.Ft.

SOILS				AGGREGATES															
				20% *#1Aggregate		80% *#2Aggregate		30% *#1Aggregate		70% *#2Aggregate		40% *#1Aggregate		60% *#2Aggregate		‡50% *#1Aggregate		‡50% *#2Aggregate	
Type of Soils	Soil / Soil + Agg. (By Weight)	Cu.Ft. Per Min.	** Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open	Cu.Ft. Per Min.	Inch Gate Open.	Cu.Ft. Per Min.	Inch Gate Open.
CAPACITY 30 TONS PER HOUR (Tonnage includes approx. 8% of water By Weight)																			
Predominately Clay	12%	1.20	3.14	1.60	2.10	6.40	8.38	2.40	3.14	5.60	7.33	3.20	4.19	4.80	6.28	4.00	5.24	4.00	5.24
Predominately Sand-Silt	20%	2.00	5.23	1.44	1.89	5.76	7.54	2.16	2.83	5.04	6.60	2.88	3.77	4.32	5.66	3.60	4.72	3.60	4.72
CAPACITY 40 TONS PER HOUR (Tonnage includes approx. 8% of water By Weight)																			
Predominately Clay	12%	1.60	4.18				†				†	4.16	5.45	6.40	8.38	5.33	6.97	5.33	6.97
Predominately Sand-Silt	20%	2.67	7.00				†	2.88	3.77	6.72	8.80	3.84	5.04	5.76	7.55	4.80	6.29	4.80	6.29

Aggregate Feeder Data:
- 9" Wide x 6" Stroke
- 40.7 Strokes per Min.
- *Capacity computed on 60% efficiency

Clay-Soil Feeder
- 19" Wide
- Speed-5.8 Feet per min.
- **Capacity computed on 50% efficiency

‡ Use this table for aggregate split other than 50-50 if only one aggregate is available.

† Opening Required Exceeds Maximum 9" Gate Opening.

Using the Mixing Tables: To use the table it is necessary to first know the type of soil available and the approximate classification of the aggregates as already discussed.

The range of aggregate combinations (to give the 50-50 split on the #4 screen) are the same as listed under the Bituminous tables except for the omission of the "all sand" and "all crushed aggregates" which are not suitable for Soil aggregate mixes. The soil column at the left, lists the two general groups of soils.

Under each of these columns appear the gate settings in inches and the material in cubic feet per minute for both the 30 tons and the 40 tons per hour capacities.

To go through an example, suppose the soil available seems to contain quite a bit of sand and silt, and suppose a 40-60 combination of aggregates to be used with the capacity to be about 30 tons per hour. We would then select the proper column for the 40-60 combination and read opposite the 20% soil selection under the 30 tons per hour.

Therefore the operator finds that the #1 aggregate gate should be set at 3.77", the #2 aggregate gate set at 5.66" and the soil gate should be set at 5.23".

All the information necessary to setting up is now available and after the operator gains experience, he can judge whether further adjustment is necessary to take care of specific conditions.

JUDGING THE MIX

After the plant has been started, the operator should study the mix and judge whether it is satisfactory. Naturally he will be in a better position to do this after some experience in observing the results on the road. However the following points will help guide him.

Proper Moisture: The value of getting the proper amount of moisture in the mix has been discussed previously under "Setting Up The Mix". The operator must watch the mix, testing a sample in his hand occasionally as it discharges from the pugmill to determine if he is adding the correct amount. By digging a small hole in the ground, a shovelful can be tamped into place to see if it compacts well and holds together. Of course it will be easier for the operator to judge a mix in the future after he has seen how a certain mix reacts after it has laid for a few days. Remember it is important to keep the moisture content near the optimum and avoid excess.

Thorough Mixing: It is important that the materials be thoroughly mixed and the clay spread uniformly thruout. Some things to watch out for:

Clay Lumps. If the clay is not being crushed into fine particles it will not mix thoroughly through the aggregate. If lumps are passing through, the crusher rolls should be adjusted to eliminate them. Some gumbo clays may be so sticky that they will pancake together after passing through the rolls. If this results in poor mixing and cannot be eliminated, try to find a more suitable clay soil.

Too Little Clay. Some soils are not suited to the soil aggregate mix since they contain too much sand or silt and not enough clay. If after testing a sample of a mix which has a satisfactory moisture content but which fails to hold together due to insufficient binder, increase the amount of soil added. If this does not help, try to find another soil which contains more clay.

Gradation of Aggregate. It has been discussed before that if the aggregate contains too much of one size of aggregate or if it contains all small sizes, it will not be stable enough to hold together when dry. Therefore, the mix should be watched to see that the proper gradation of aggregate is present so that it will compact without voids.

LAYING THE MIX

The soil-aggregate mix must be properly placed in order to insure its permanance and success. Even though the mix is properly proportioned thruout, the mix must be thoroughly compacted to insure stability etc. The reason for this compaction is to eliminate voids between particles so that the particles will interlock and bind tightly under loads. In order to accomplish this, the mix should be tamped or rolled in lifts. This means that it should be placed and tamped in layers of two or three inches from the bottom up.

Since the water content controls this amount of compaction, and since the mix from the pugmill is checked to insure the proper amount of water in the mix, it is important that the mix be layed and compacted very soon after in order to avoid loss of water by evaporation.

PLANT SET-UPS

CONTENTS

SELECTION AND GENERAL LOCATION OF PLANT SITES

The location of both the Bituminous Plant Setup Site and the Soil-Aggregate Mix Plant Setup Site depends on the paving project and its relation to the paving materials required as well as other supplies involved. It is assumed that Bitumen for the Bituminous Mixes will be available as it is necessarily a product not to be found locally and thus will not materially influence the selection of the site.

In general, it will be desirable to set up near the project, however, the location of aggregates needed may not make this possible. The machines being highly mobile, and simple and quick to erect, it is easy to move them either to the aggregate source of supply or to the site of the project, depending on whether it is easier to haul mixed material or aggregates. Sometimes, of course, usable aggregates may be found right at the Project. Occasionally a centralized setup near an aggregate supply may be preferred if there are several projects in the same vicinity. Remember, for Soil-Aggregate construction, water is required so an adequate supply should be considered in the plant site selection.

The actual layout of the plants is outlined with dimensioned layouts in the following pages. A measuring tape of approximately 50 feet in length will be required to expedite the locating of the units.

BITUMINOUS PLANT SETUP

General Layout of Plant Site

The Bituminous plant consists of the 831 Dryer and the 841 Mixer, using the 831 Elevator to charge the aggregate hopper on the Dryer, See Fig. 5 and Fig. 6. In order to facilitate the setup of these units, because of transfer points and correct operation of units, it it desirable to select a level or nearly level, well drained ground location. The space required for the units only, should measure about 45 feet by 30 feet although additional area will be required to accommodate aggregate stockpiles and truck driveways. See Fig. 9.

If the aggregate stockpile is already in place, it will determine where to place the units in relation to the pile for feeding aggregates to the charging elevator. An alternate layout with the Mixer on the opposite side of the Dryer is possible if there are space limitations, although the one given is the most practical and efficient.

Method of Supporting Plant Units

The 841 Mixer and the 831 Dryer are supported in their respective positions on their trailing axles and the built-in adjustable jack legs which support the end carried by the tractor-truck or towing dolly. See Fig. 7. To keep the units in position, the parking brakes should be set securely. Due to uneven ground, it may be necessary to block under one wheel, the adjustable jacks taking care of the other end both lengthwise and laterally. A hydraulic hand jack is furnished to assist in these operations.

Setting the Mixer

The Mixer is placed first for two reasons; one, because it would be difficult to maneuver it into place after the Dryer was set; and two, because time is required to connect to the bitumen supply and fill the storage tank especially if heating is necessary; therefore, the other machines can be set up while this is being done.

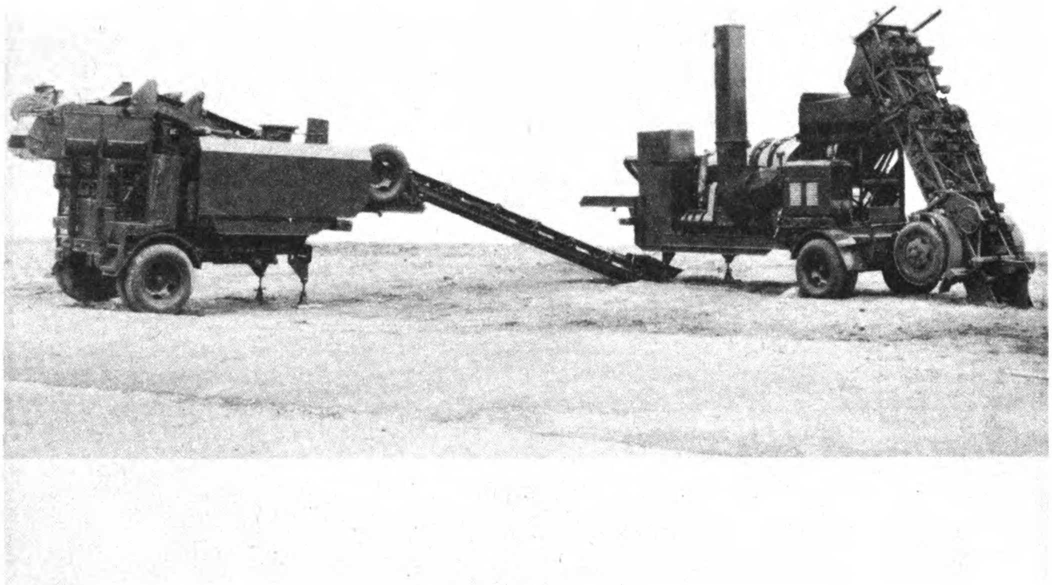


FIGURE 5

Bituminous plant setup showing mixer, left, dryer and bucket elevator.

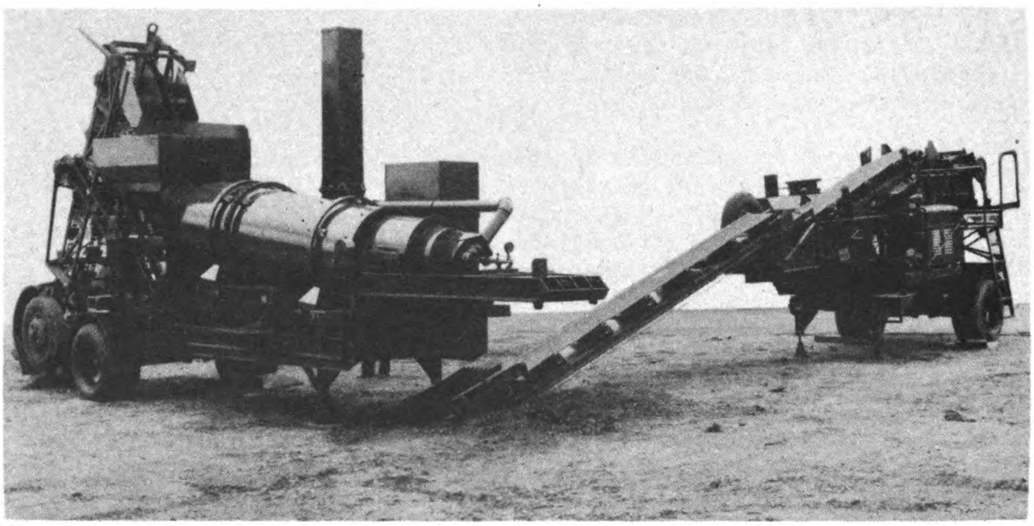


FIGURE 6

Same units from opposite side showing relative position of mixer conveyor beneath dryer.

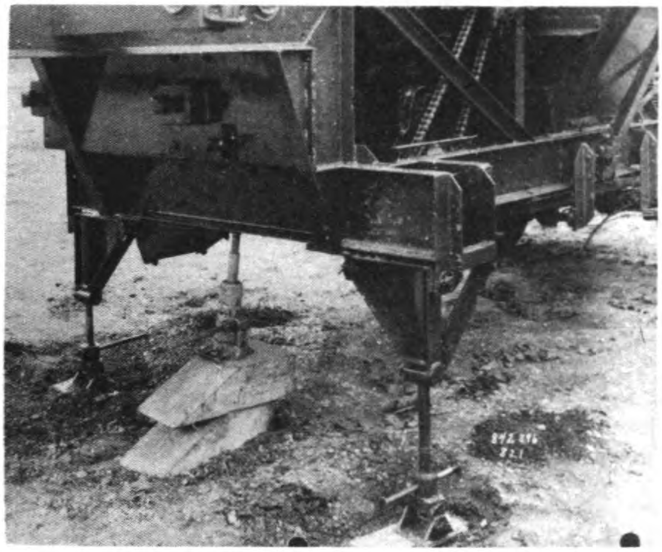


FIGURE 7

Built-in, adjustable jacklegs supporting one of the units. The hydraulic jack in the center assists in moving machines into position.

If a stock pile is already in place, the center line of the mixer conveyor should not be placed less than 32'-7" from the edge of the stock pile, see Fig. 9. If none, the approximate position of the plant may be determined, and the mixer towed into place. Set the jacklegs, apply the parking brake, remove the trailer unit and level up the mixer. Several men are then required to work on the mixer to attend to such details as making the telescoping conveyor ready for lowering, connecting the supply lines to the mixer tank, and filling the tank, and heating it if necessary.

SETTING THE DRYER

To set the dryer, it is first necessary to stake out on the ground its position with relation to the mixer. This is done by placing stakes as shown in Fig. 9. Place the first stake at the edge of the mixer tire and in line with the center of the wheel at "A". Sight down the center line of the mixer conveyor belt and place the second stake "B" on this line and 29'-6" from "A". From "B" measure 14'-7" at right angles to the conveyor and place stake "C". This stake marks the outer edge of the dryer wheel. Then place stake "D" as shown.

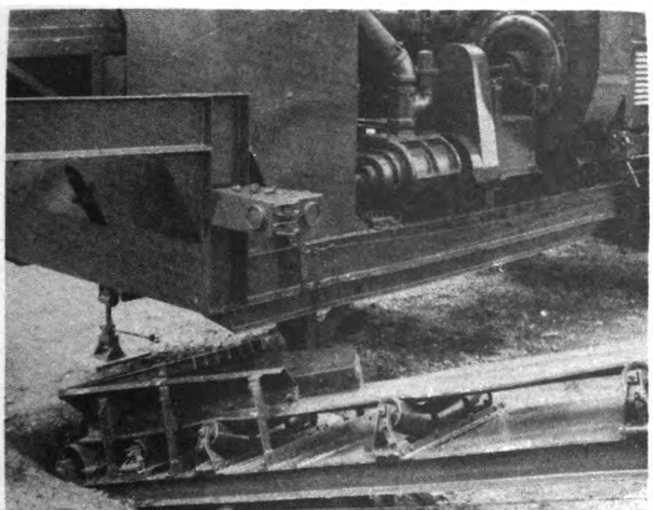
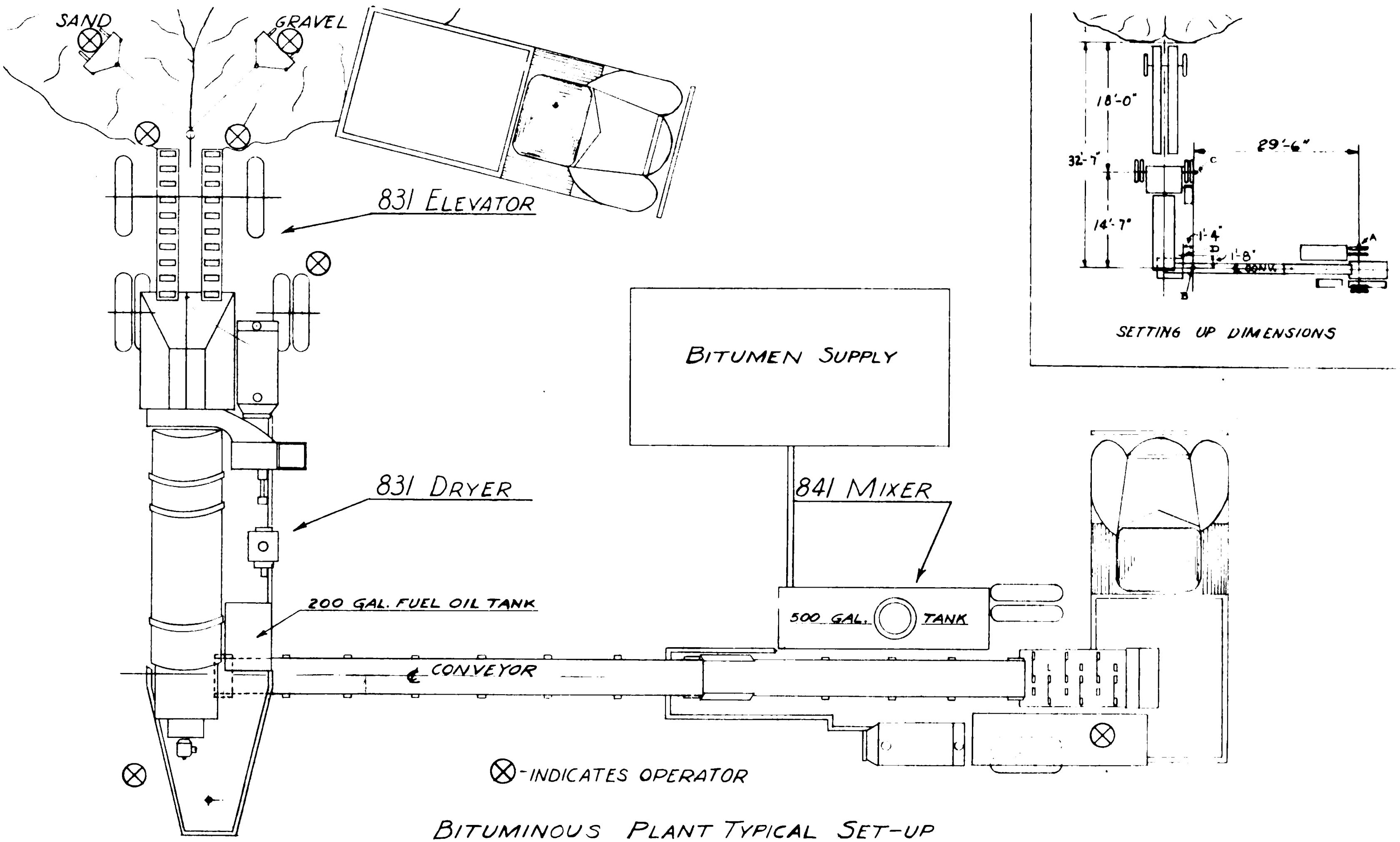


FIGURE 8

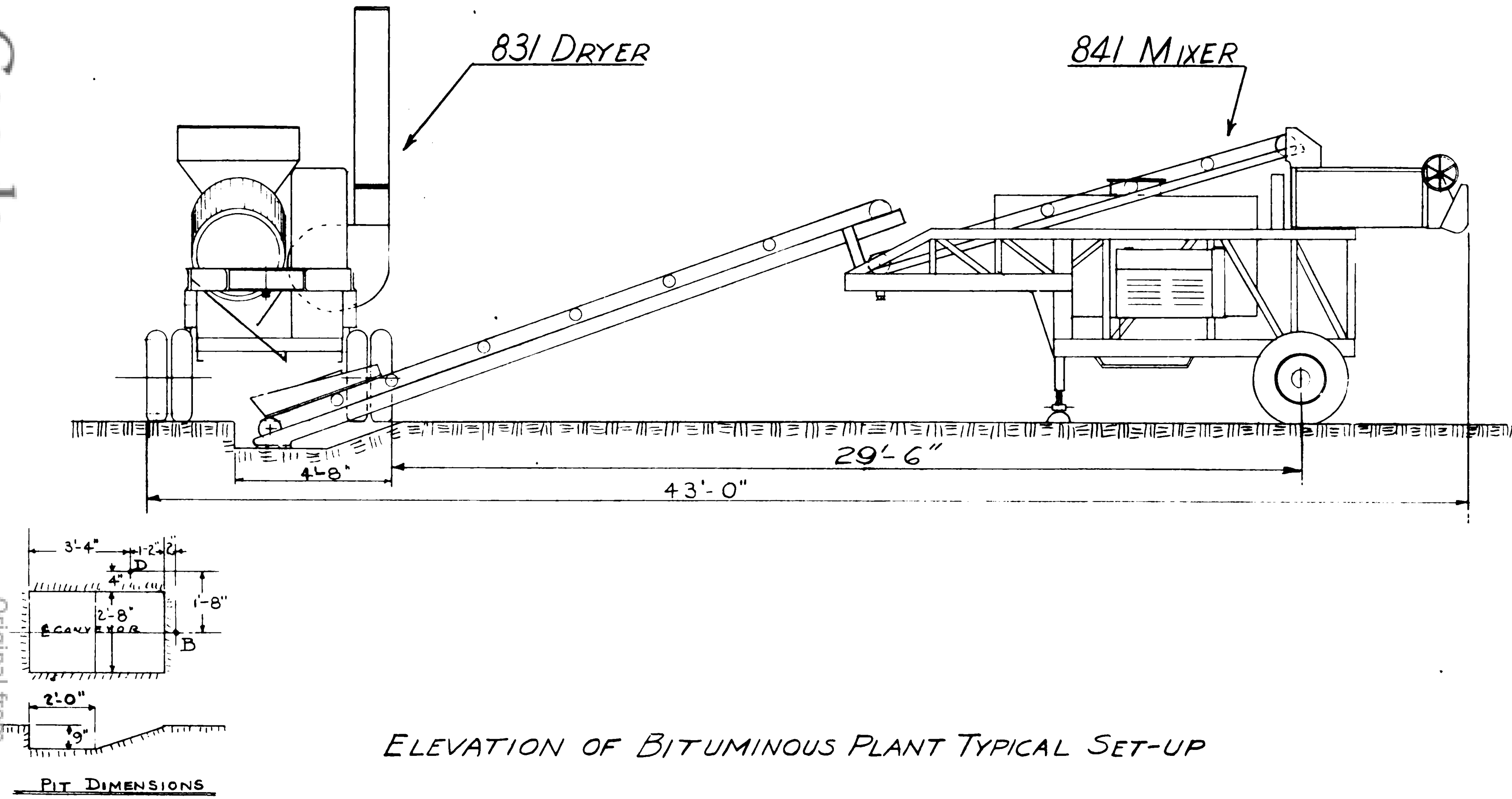
Discharge end of dryer drum showing method of installing mixer conveyor to receive the dried aggregate.



⊗-INDICATES OPERATOR

BITUMINOUS PLANT TYPICAL SET-UP

FIGURE 9



ELEVATION OF BITUMINOUS PLANT TYPICAL SET-UP

FIGURE 10

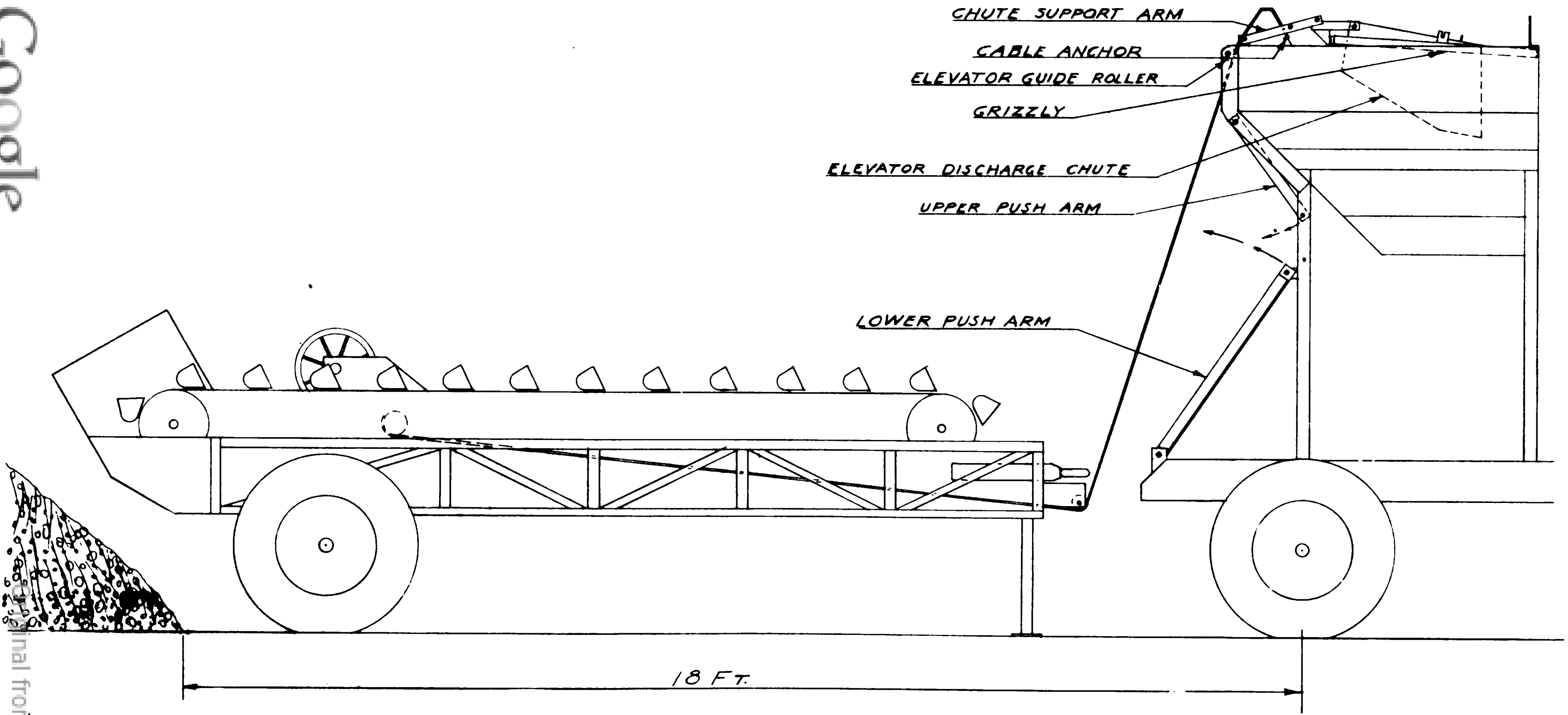


FIGURE 11

Bucket Elevator in position to start raising to the aggregate hopper of the dryer.

The Bucket Elevator is placed in its approximate working position now, since it is difficult to place after the dryer is set-up.

The dryer is then backed into position and maneuvered until the rear wheel is against the stake "C", and in line with the center of the axle. Also the center of the jackleg falls on stake "D". This will get the dryer in a position so the discharge chute from the dryer will discharge properly onto the mixer conveyor. Before unhooking, it is good practice to check this position by sighting down the mixer conveyor belt. After the correct position has been reached, set the dryer parking brakes and lower the jacklegs.

After the truck tractor or dolly has been removed, it is important to level up the main frame of the dryer with a level and supporting the dryer in this position with the adjustable jacklegs. The dryer is so built that when the dryer is approximately level (main frame), the dryer drum will assume its proper slope of about 6 degrees.

RAISING THE ELEVATOR

While the dryer is being leveled, the bucket elevator can be raised into position. Move the elevator until it is directly in position in line with the hopper and then set it on the jacklegs. See Fig. 11, 12, & 13. Remove the towing tongue then unwind the hoist cable, pass it underneath the sheave at the tongue end and then up over the bracket on top of the hopper and anchor in the hole provided. Take up on the cable enough to raise the elevator slightly off the ground so that the a jacklegs may then be raised up and bolted out of the way.

Continue to crank the elevator up making sure that it is going up in approximate position. A point will be reached where the wheels leave the ground just about the time that the elevator frame contacts the top of the hopper. At this point, disconnect the lower push-arms from the dryer and swing them out into place to show how much more the elevator will have to be raised.

Raise the elevator then and attach these push-arms. Unbolt the upper push-arms from the hopper frame supports and swing them out into position and connect them to the elevator frame.

Swing the discharge chute up from the hopper into place underneath the bucket. Put the drive chain on which drives the elevator countershaft from the feeder crankshaft on the dryer unit. Then unwind the cables from the drums on the drag scoop shafts on the dryer, pass them

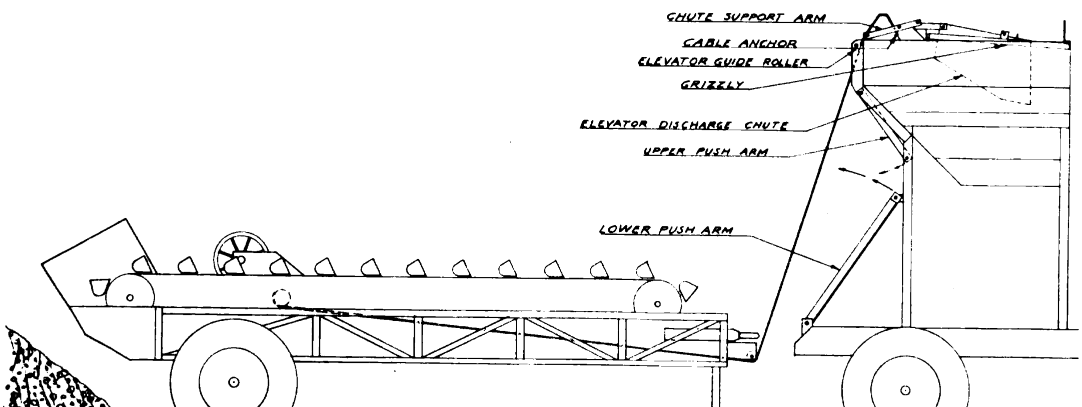


FIGURE 12

Model 831 Bucket Elevator partially raised showing supporting arms not yet attached. Notice the rubber tires are just leaving the ground.

down around the sheave underneath the dryer and then out through the elevator sheave through the sheave so that these can then be connected to the drag scoop.

By this time the dryer unit should have been leveled, the stack raised and the fuel tanks filled if necessary.

LOWERING THE CONVEYOR

While the elevator is being raised, the mixer conveyor can be lowered into position. Unfasten the hinged portion of the telescoping section of the conveyor by removing the keeper-pin from the support over the pugmill. Then raise this section and insert the same pin in the proper place to straighten the conveyor out. Then remove the lock-bar from the front of the conveyor and allow the conveyor to slide gradually to the ground by checking it with the hoist, if necessary. Normally, it should come to rest 9" below ground line with the hopper under the dryer discharge chute, but because of variations in the slope of the ground and flexibility of the conveyor, it may not be necessary to dig out if the conveyor clears the side of the dryer frame. If a hole is needed, the approximate dimensions are given on Fig. 10. Just before the final position of the conveyor is reached, slip the drive chain over the head shaft sprocket. Then lower it the final few feet and insert the lock-bar to hold the conveyor solidly in position during operation.

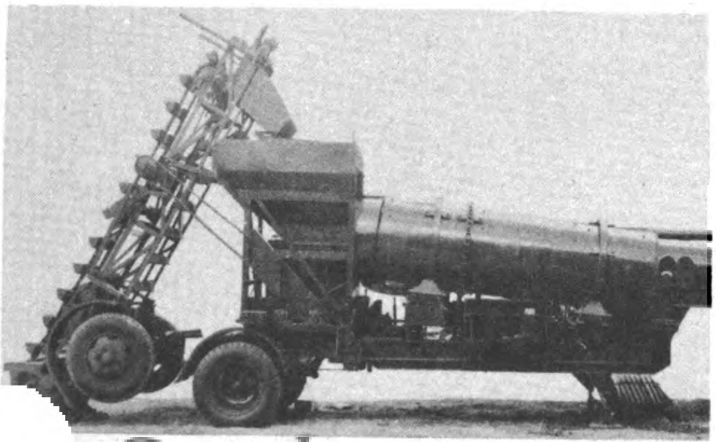


FIGURE 13

Bucket Elevator in position on the 831 Dryer showing push-arms in place and the drive chain attached.

PREPARATIONS FOR MOVING THE PLANT

After mixing is completed and it is desired to move the plant, the first step should be to clean out the hopper, pugmill, piping, and to empty the tanks. The mixer asphalt storage tank should be flushed and drained. See Plant Operations.

To raise the telescoping conveyor, remove the lock-bars, slip off the drive chain, and then by means of the hand hoist provided, pull the conveyor up into position, the conveyor riding on rollers. Several men should assist by supporting the weight of the lower end during this operation. Replace the lock-bar to hold the conveyor secure and then bend the conveyor at the joint, fastening the hinged portion down to the support over the pugmill with the keeper bar provided.

Before lowering the elevator, first unfasten the drag scoops from the cables and wind these cables up out of the way anchoring them to the drum. Swing the discharge chute on top of the hopper down out of the way, unfasten the push-arm and disconnect the drive chain and remove it. Connect the hoist cable to the anchor on top of the hopper if it is not already in position.

Complete the details of getting the dryer ready for travel such as lowering the stack, fastening the push-arms back out of the way. The Machine should now be ready for travel and should be checked to see that everything is fastened securely.

GENERAL TOWING INSTRUCTIONS

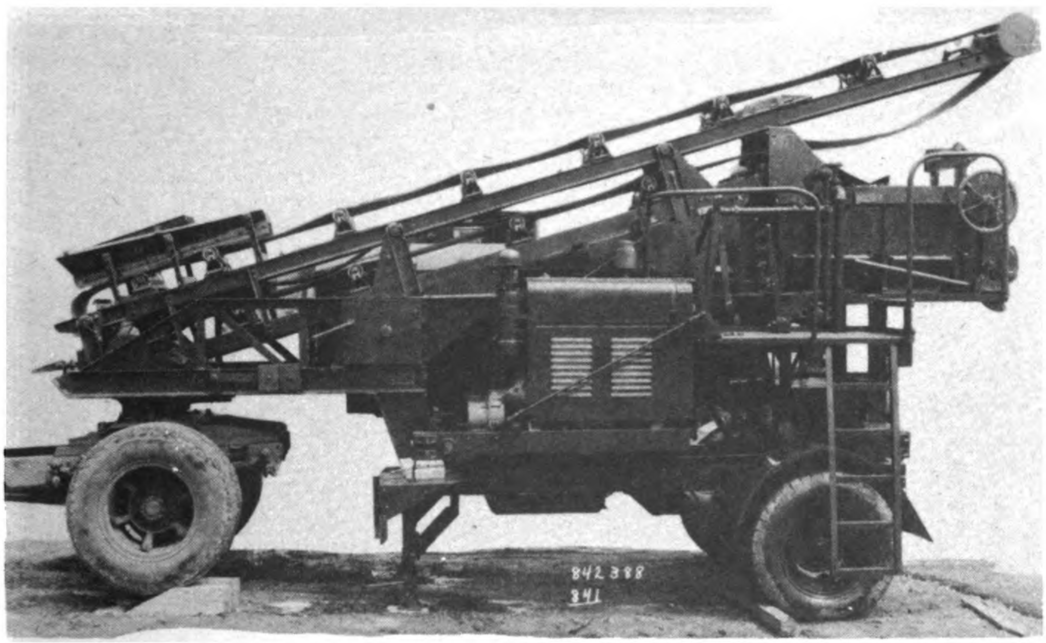


FIGURE 14

Mixer with conveyor raised but before bending upper right section. Jacks are still lowered and fifth wheel on tractor, left, has just made contact.

To tow the Dryer and Mixer jack up the front end (using the hydraulic jack furnished) until the tractor-truck or a dolly can be backed under the fifth-wheel connecting pin. The mechanical brake should be set to hold the rear wheels while engaging the fifth-wheel to avoid pushing the machine out of position.

As soon as the fifth-wheel is in its position, jacks on machine can be released. Next, connect the service air brake line and emergency air brake line to their proper connection at the front of the machine. If a dolly is being used, the air brake connection for the dolly brake under the gooseneck frame must be connected to the dolly brake.

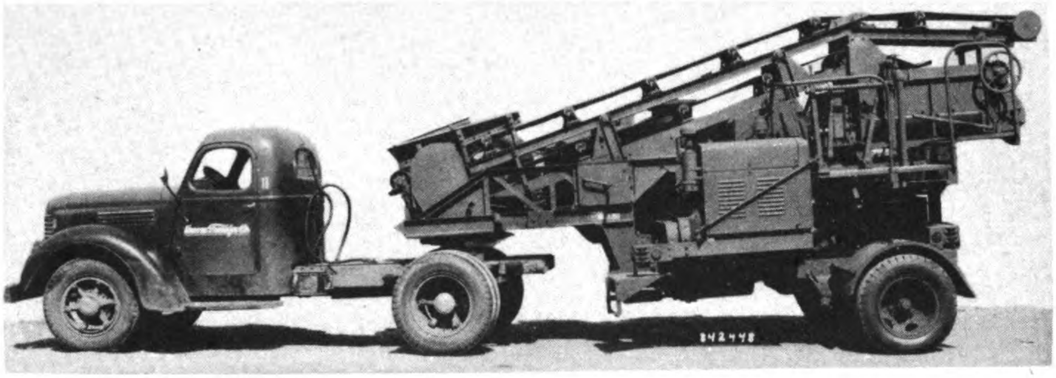


FIGURE 15

Model 841 Mixer in towing position.

After this has been done, turn the air cock valve handle immediately behind the air hose connection on the machine so that the handle is parallel with the hose line. This setting will permit air to travel to the dolly brake units. When the air cock valve handle is turned crosswise to the air line, the line is closed to air traveling through and it is turned in this position when only a tractor-truck is used.

After brake connections are made, release the mechanical brake. It is generally good practice to try the air brake before starting out for any distance to be absolutely sure they are functioning properly.

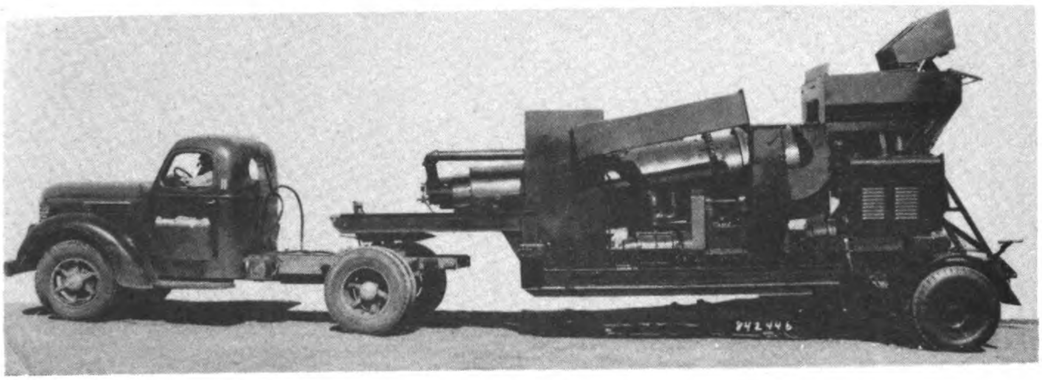


FIGURE 16

Model 831 Aggregate Dryer in towing position.

The emergency line, when air is supplied by the tractor unit, will fill the small tank on the side of the machine. The cock on the bottom of this tank should be opened for an instant to test for air pressure and then closed. As long as the air lines are connected, the air in this tank will not function,but when air lines are broken, either accidentally or in disconnecting, an automatic valve will re-ease the air causing the brakes to set. To release the brakes, the k in the bottom of the tank must then be opened.

(See accessory manual for adjusting brake with slack adjuster)

FIGURE 17

Model 831 Bucket Elevator being towed behind Model 831 Dryer.

When 831 Elevator has been made ready for towing by extending the towing tongue and securely fastening the hoisting cable, it can be attached to a truck unit or attached to the pintle connection at the rear of the Mixer or Dryer Units. When properly connected, the jack legs can be raised and fastened.

Tires should be checked for air pressure (55#) before towing these units. Generally after setting in operation for a period of time, each tire will require air to bring it up to proper inflation pressure.

As noted on plate attached to each machine, they should not be towed over 35 miles per hour. Care should be taken in watching for road clearances, sharp turns, etc.

SOIL AGGREGATE PLANT SETUP

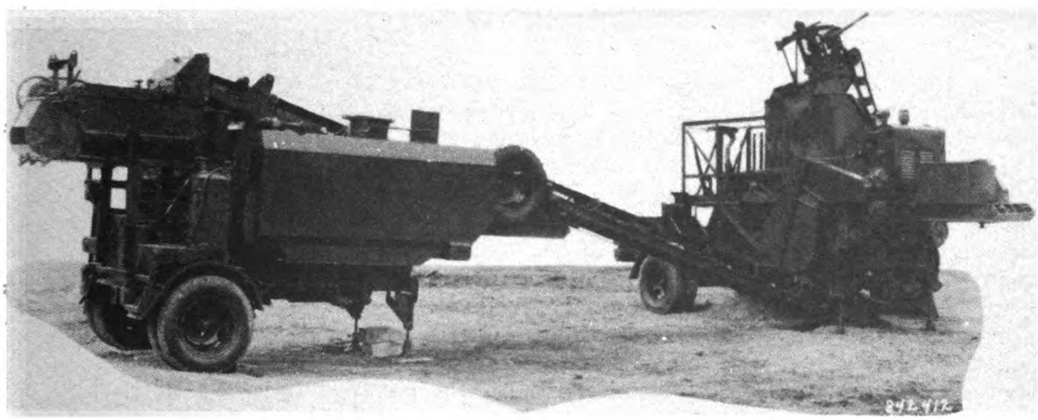


FIGURE 18

GENERAL LAYOUT OF PLANT SITE

The Soil-Aggregate Plant consists of the 821 Soil-Preparation Unit, and the 841 Mixer, using the 831 Elevator to charge the

aggregate hopper on the Soil-Preparation Unit. In order to facilitate the setup of these units, because of transfer points and correct operation of the units, it is desirable to select a level or nearly level, well drained ground location (similiar to Bituminous Plant). The space required for the units need only to measure about 50 feet by 20 feet although additional area will be required to accommodate aggregate stock piles and truck drive ways as well as a clay soil stock pile. See Fig. 21.

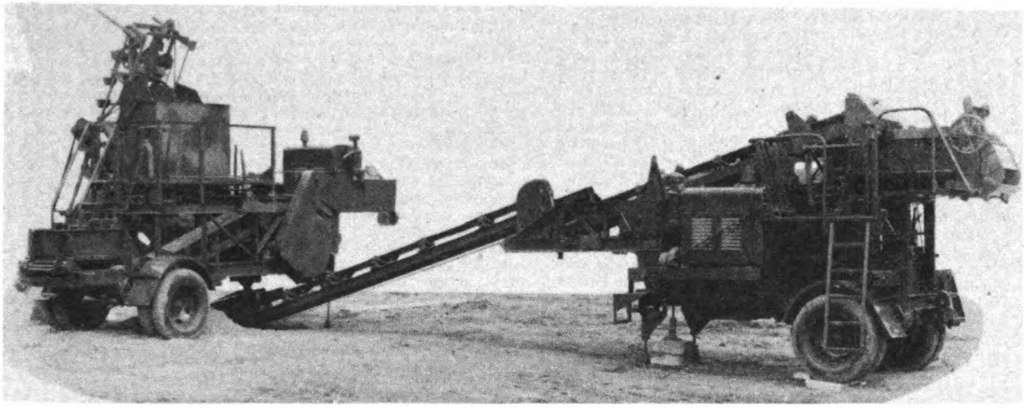


FIGURE 19

Soil aggregate plant set up showing Mixer at right and Soils Unit at left. The latter is being fed by the Bucket Elevator. This is the opposite side from that shown in Figure 18.

METHOD OF SUPPORTING PLANT UNITS

The 841 Mixer and the 821 Soil Preparation unit are supported in their respective positions on their trailing axles and the built in adjustable jack legs which support the end carried by the tractor-truck or towing dolly. See Fig. 7. To keep the units in position, the parking brakes should be set securely. Due to uneven ground, it may be necessary to block under one wheel, the adjustable jacks taking care of the other end both lengthwise and laterally. A hydraulic hand jack is furnished to assist in these operations.

SETTING THE MIXER

The first step in setting up the plant is to place the 841 Mixer in correct position. If the aggregate stockpile is not present, an approximate location is adequate; but if the stockpile is already present, it is necessary to spot the mixer so that it will leave room to raise the elevator. See Fig. 21. From this diagram we see that the first thing to do is to spot a stake "A" where the Mixer rear axle should be. The truck driver can then tow the Mixer into place, the jack legs can be lowered, the towing unit removed after setting the parking brake. The necessary leveling can then be done. Several men are then required to work on the mixer to attend to such details as making the telescoping conveyor ready for lowering, connecting the water supply lines and filling the tank.

SETTING THE SOIL PREPARATION UNIT

To set the Soil Preparation Unit, it is first necessary to stake out on the ground its position with relation to the mixer. This is done by placing stakes as shown in Fig. 21.

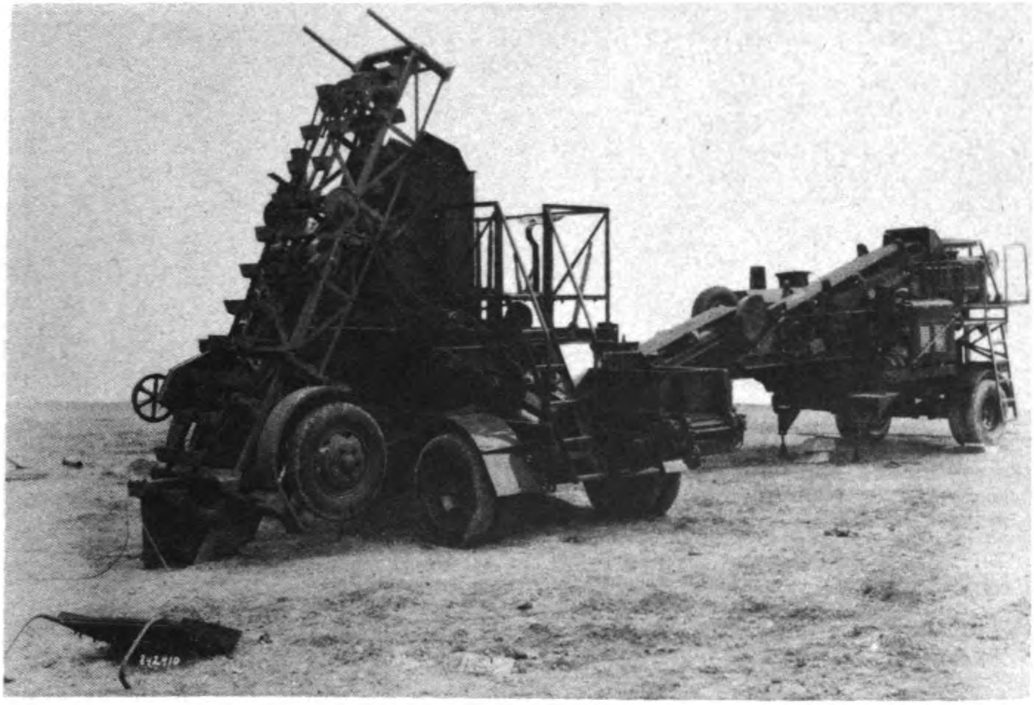
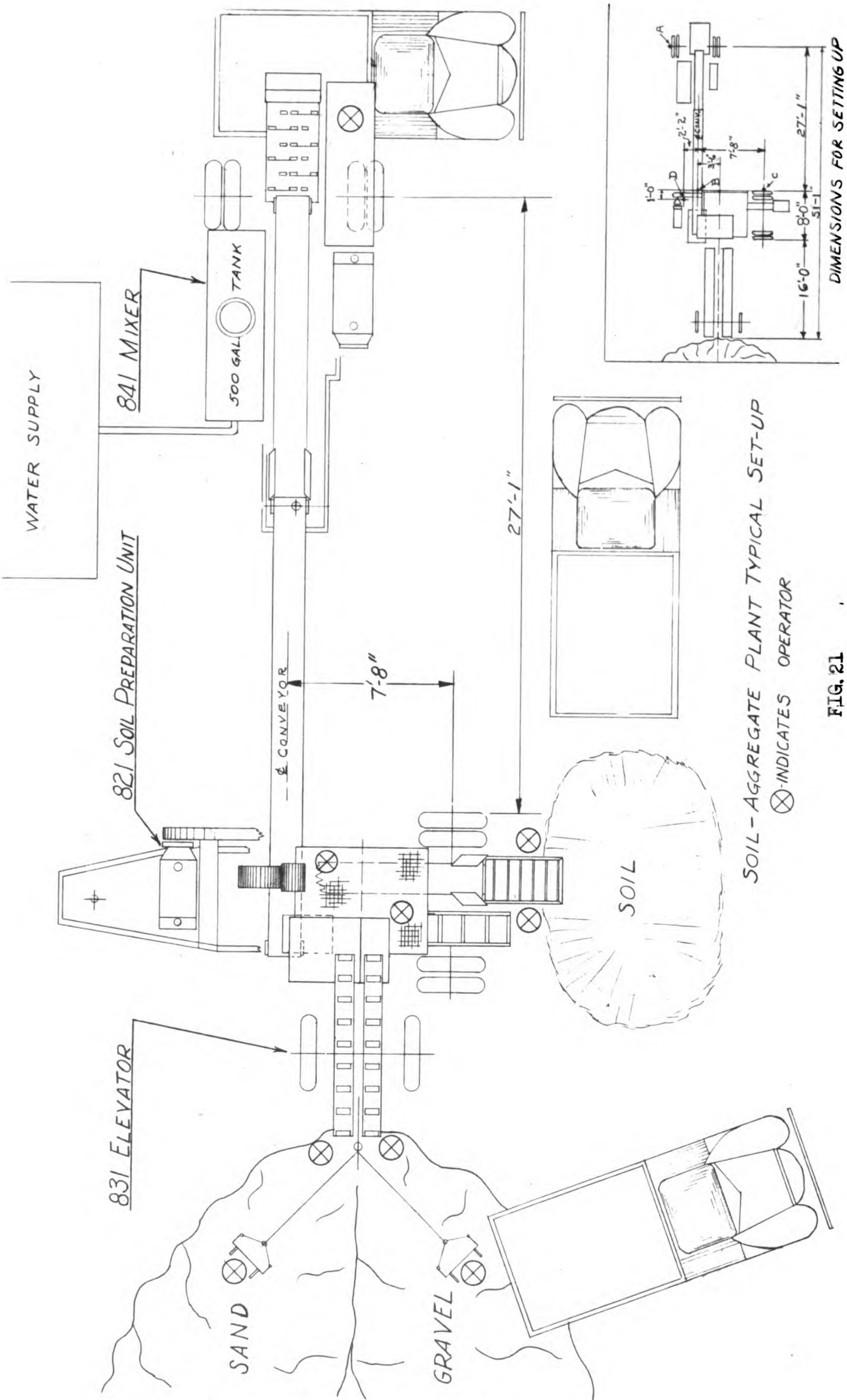


FIGURE 20

The two drag scoops are fanned out from the Bucket Elevator to pull aggregate up to the Bucket Elevator. The soils hopper on the 821 Soils Unit is just to the right of the operator's ladder.

Sight down the center line of the mixer conveyor belt and place stake "B" on this line and 27'-1" from "A". From "B" measure 7'-8" at right angles to the conveyor and place stake "C". This stake marks the outer edge of the rear wheel on the Soil Preparation Unit. Then place stake "D" as shown.



SOIL-AGGREGATE PLANT TYPICAL SET-UP

⊗ INDICATES OPERATOR

FIG. 21

The Bucket Elevator is placed in its approximate working position now since it is difficult to place after the Soil Unit is set-up.

The Soil Unit is then backed into position and maneuvered until the rear wheel is against the stake "C" and in line with the center of the axle. Also the center of the jackleg falls on stake "D". This will get the Soil Unit in a position so the discharge from the reciprocating feeder, and crusher rolls fall properly onto the mixer conveyor. Before unhooking, it is good practice to check the position by sighting down the mixer conveyor belt.

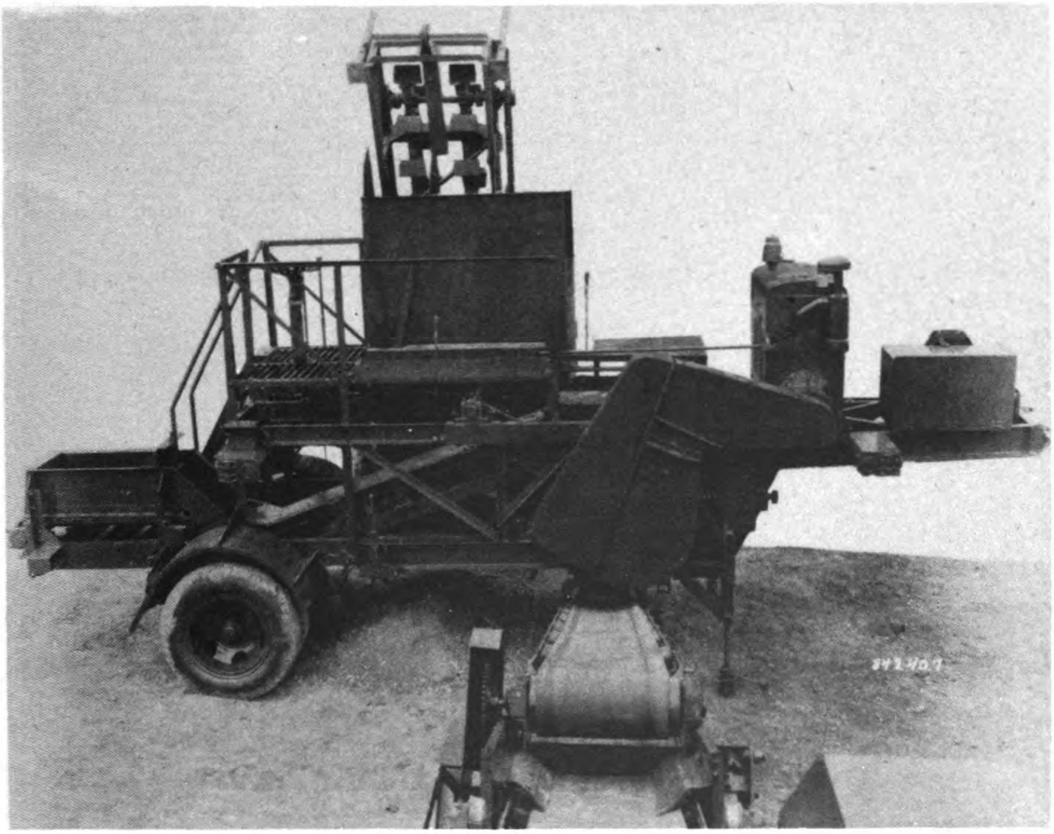


FIGURE 22

Checking position of the Soils Unit by sighting down the Mixer conveyor.

After the correct position has been reached, set the parking brake and lower the jacklegs.

RAISING THE ELEVATOR

The next step is to raise the 831 Elevator. To place it in approximate position, back it around the 821 machine and move it until it is at right angles with the aggregate hopper and so that the center of the Elevator is in line with the hoist bracket on the top of the hopper. See Fig. 23 & 24.

Let down the two small jacklegs at the front of the machine to support it while the cable is being unwound from the drum, pass under the sheave at the tongue end after the tongue has been slid back out of the way, and then hook in the anchor brackets on the top of the machine hopper.

Tighten up on the cable and lift the jacklegs slightly off the ground so that they can be unbolted and shoved up into the support and then bolted to lock them in position out of the way for raising.

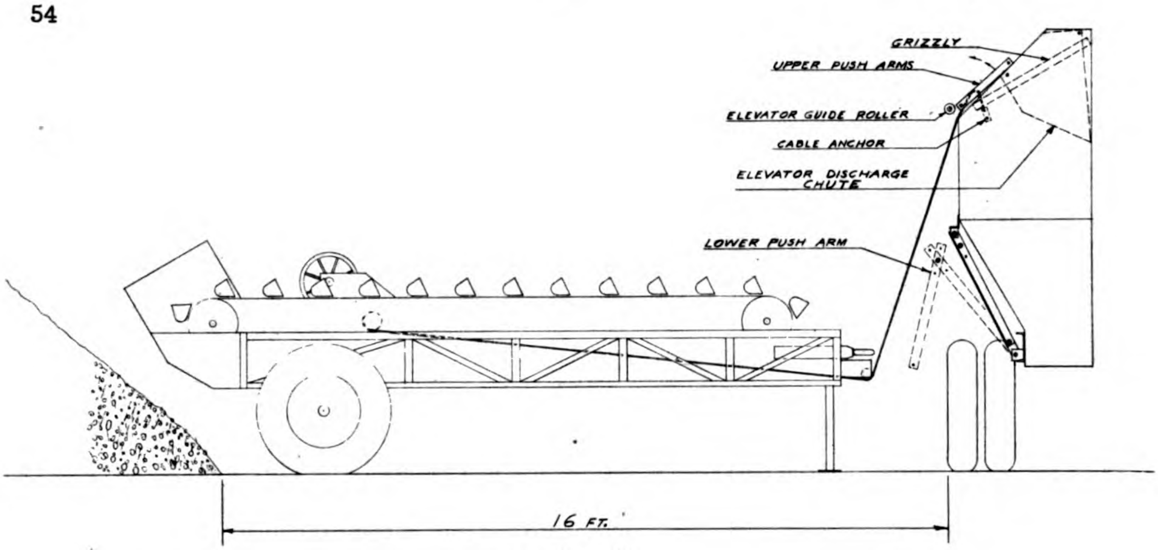


FIGURE 23

Bucket Elevator in position to start raising to the aggregate hopper of the Soils Unit.

Continue to crank the Elevator up on the machine so that the frame will eventually slide upon the two support rollers on top of the hopper and finally until the wheels leave the ground and the Elevator is resting on the boot casing.

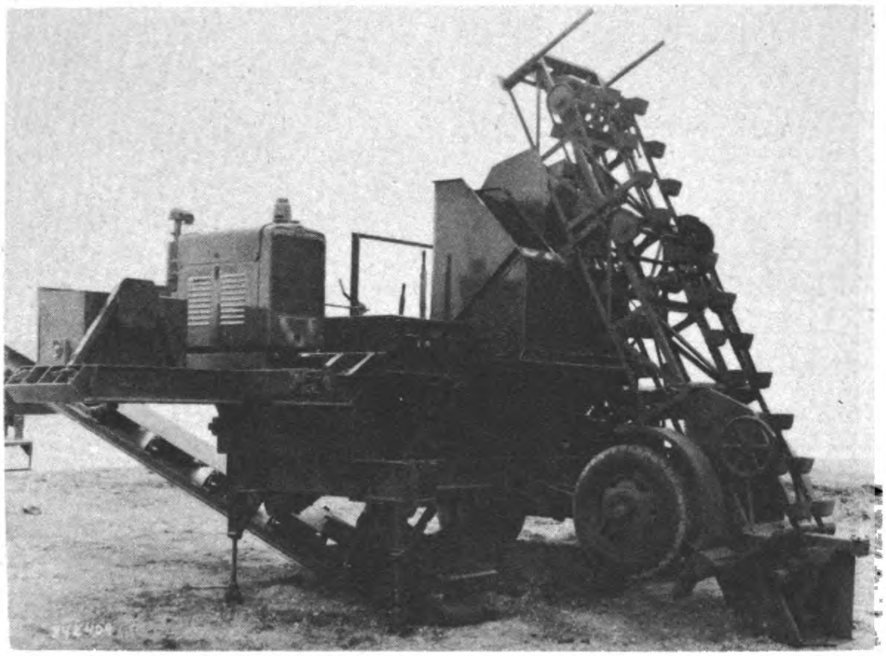
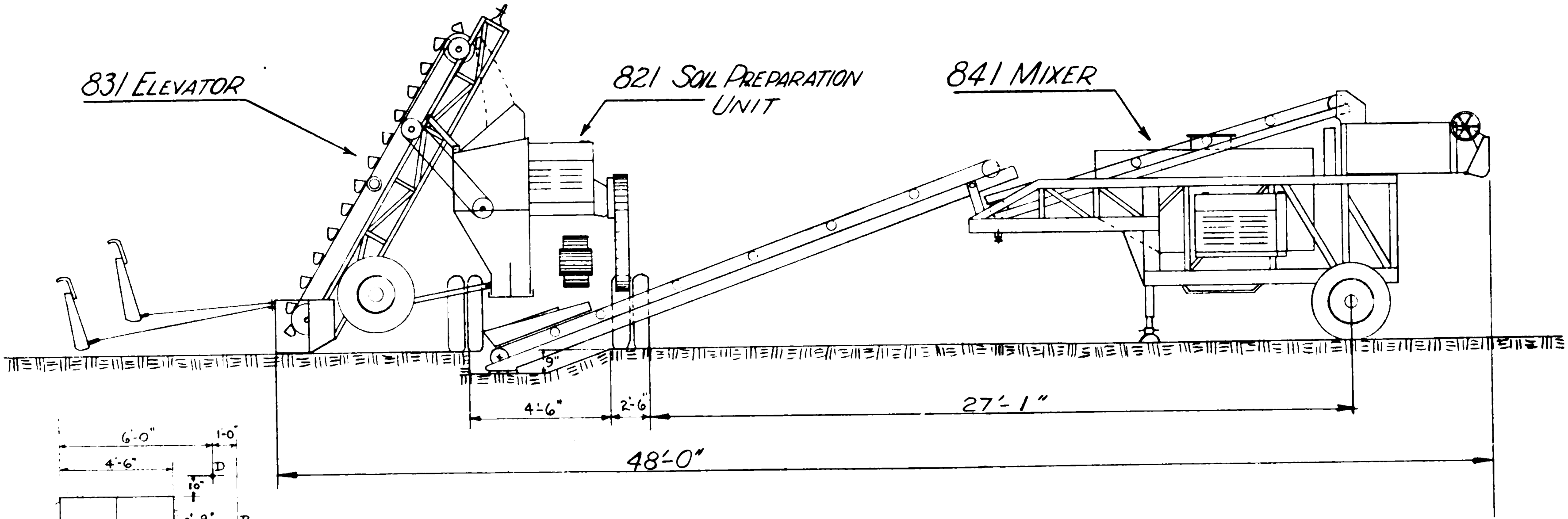


FIGURE 24

Bucket Elevator in position on Soils Unit.

Unfasten the lower push arms from the Soil Unit which jackknifes out, and swing them out to see how much more the Elevator needs to be raised. Continue to crank the Elevator up until it is in position, bolt the lower push arm into place then secure the upper push arm. When the Elevator is secure, the drive chain can be put on. At the same time unloosen the weighted idler which can be bolted to the frame so that it will be secure when traveling.



ELEVATION OF SOIL-AGGREGATE PLANT TYPICAL SET-UP

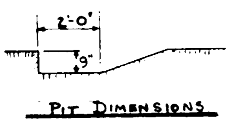


FIGURE 25

LOWERING THE MIXER CONVEYOR

While the Elevator is being raised and the remaining details of making the 821 ready are being taken care of, the Mixer should be prepared for operation. Before the conveyor can be lowered, it is necessary to dig a shallow pit under the 821 rolls and the plate feeder so that the end of the conveyor can be lowered into the ground enough to pass under the chain guard. This pit should be dug according to the demensions shown on Fig. 25. After the pit has been dug, get the Conveyor ready for lowering by straightening out the hinged portion of the telescoping section. Then remove the lock bar and begin to lower the Conveyor letting it down gradually, using the hand hoist to check it. Just before it reaches the operating position, put on the drive chain and check to see that the elevator will end up in the correct position by sighting down the belt. Then lower it all the way and replace the lock bar which finishes the lowering process.

When lowering the Conveyor it may not want to clear under the chain guard; therefore, use the hydraulic jack to jack up the Mixer and then unscrew the jacklegs enough so when the hydraulic jack is released the end of the Mixer will be lowered so that the Conveyor will then drop down slightly enough to clear under the chain guard. See Fig. 22. Then after the Conveyor has been placed under the Soil Unit, the jack can again be used to raise the end of the Mixer slightly and then to level the Mixer again for operation.

Returning to the 821 Soil Preparation Unit and the 831 Elevator, it is necessary to unwind the drag scoop cables from the drums, passing them throuth the two Dryer sheaves out through the 831 Elevator sheaves and then to connect them to the drag scoops themselves. The discharge plates on the 821 aggregate hopper can then be swung up into position and bolted to direct the aggregate from the buckets. The grizzly bar screen can then be placed over the top of the hopper if they are not already in position.

With the conveyor lowered, the elevator raised, drag scoops connected, the machine is now ready for operation as discussed under the section entitled "Machine Operations."

PREPARATIONS FOR MOVING THE PLANT

After mixing is finished, empty the hoppers and clean out the pugmill. If material is left in the pugmill, hardened or settled, it will be difficult to clean out later on. Raise the Mixer-Conveyor and disconnect the supply piping while the elevator is being lowered.

To raise the Conveyor, pull out the lock bar and crank the telescoping section up with the aid of several men lifting at the lower end. When raised, replace the lock bar, then take out the keeper pin so that the Conveyor will break and then can be fastened down to the support over the pugmill using the same keeper pin.

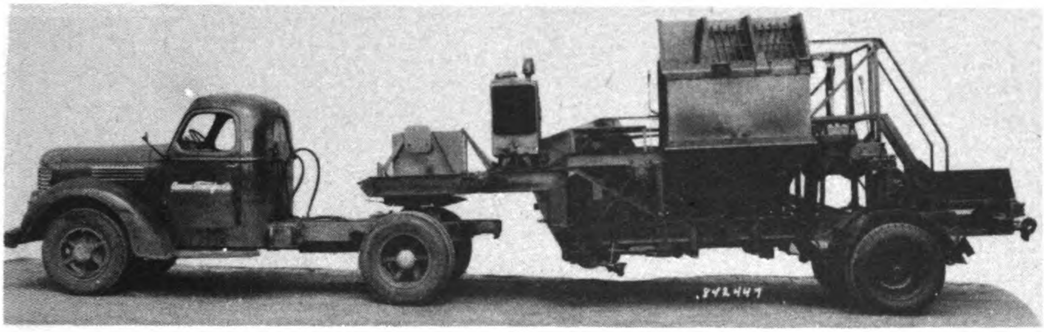
Before lowering the elevator, it is necessary to disconnect the drag scoops and release the cables from the sheaves so that they can be wound up and locked on the drum.

Swing the discharge plate down into the hopper for clearance and remove the grizzly bars if desired. Remove the drive chain from the drive sprocket to the elevator. Then fasten the push arms and fold them back out of the way so that the elevator is free.

To lower the elevator, it is necessary to pull the bottom end out until the wheels hit the ground, then it will easily lower itself simply checking its lowering by keeping the hoist cable tight. To pull the bottom end out it can be attached to a truck or a winch. When the elevator is lowered, fasten the hoist cable and set the jacklegs until it can be towed away. The other machines should be ready for travel by this time.

GENERAL TOWING INSTRUCTIONS

To tow Soil Preparation Unit and Mixer, jack up the front end (using the hydraulic Jack furnished) until the tractor-truck or dolly can be backed under the fifth-wheel connecting pin. The mechanical brake should be set to hold the rear wheels while engaging the fifth-wheel to avoid pushing the machine out of position.



821 Soil Preparation unit in towing position. For towing 841 mixer, see Fig. 15.

FIGURE 26

As soon as the fifth-wheel is in its position, jacks on machine can be released. Next, connect the service air brake line and emergency air brake line to their proper connection at the front of the machine. If a dolly is being used, the air brake connection for the dolly brake under the gooseneck frame must be connected to the dolly brake. After this has been done, turn the air cock valve handle immediately behind the air hose connection on the machine so that the handle is parallel with the hose line. This setting will permit air to travel to the dolly brake units. When the air cock valve handle is turned crosswise to the air line, the line is closed to air traveling through and it is turned in this position when only a tractor-truck is used.

After brake connections are made, release the mechanical brake. It is generally good practice to try the air brake before starting out for any distance to be absolutely sure they are functioning properly.

Tbe emergency line, when air is supplied by the tractor unit, will fill the small tank on the side of the machine. The cock on the bottom of this tank should be opened for an instant to test for air pressure and then closed. As long as the air lines are connected, the air in this tank will not function but when air lines are broken either accidentally or in disconnecting, an automatic valve will release the air causing the brakes to set. To release the brakes, the cock in the bottom of the tank must then be opened.

(See accessory manual for adjusting brake with slack adjuster)

When 831 Elevator has been made ready for towing by extending the towing tongue and securely fastening the hoisting cable, it can be attached to a truck unit or attached to the pintle connection at the rear of the Soil Preparation Unit or Mixer. When properly connected, the jack legs can be raised and fastened.

Tires should be checked for air pressure (55#) before towing these units. Generally after setting in operation for a period of time, each tire will require air to bring it up to proper inflation pressure.

As noted on plate attached to each machine, they should not be towed over 35 miles per hour. Care should be taken in watching for road clearances, sharp turns, etc.

PLANT OPERATION

841 Mixer Unit

831 Dryer Unit

831 Portable Bucket Elevator

821 Soil Preparation Unit

Machinery Adjustments

FIGURE 27

Model 841 Pugmill Mixer. Telescoping conveyor is still in towing position with collapsing section folded down for lower clearance.

FIGURE 28

Opposite side of the Model 841 Pugmill Mixer showing bitumen tank, etc.

841 PUGMILL MIXER

Transfer Conveyor

Function and Operation

The transfer conveyor (Fig. 30) is a rubber belt conveyor which carries the prepared aggregate from either the 831 Dryer or the 821 Soil Preparation Unit to the pugmill of the 841 Mixer.

When it is operating, one end is on the ground. However, in order that the machine may be trailed, the conveyor is constructed in two sections. One is a fixed section and the other is a movable or telescoping section (Fig. 29) which slides over the fixed section. This telescoping section is raised and lowered by a hand-operated cable hoist which connects to the lower end. Several men are required to assist the man who is cranking to raise the section by picking up the bottom end and starting the conveyor sliding back on the support rollers.

The telescoping section has two positions. One is the operating or down position and the other is the trailing or up position. Both are fixed by a lock bar located near the foot shaft of the fixed section. This bar is inserted through holes in the lower support roller bracket and the frame of the telescoping section.

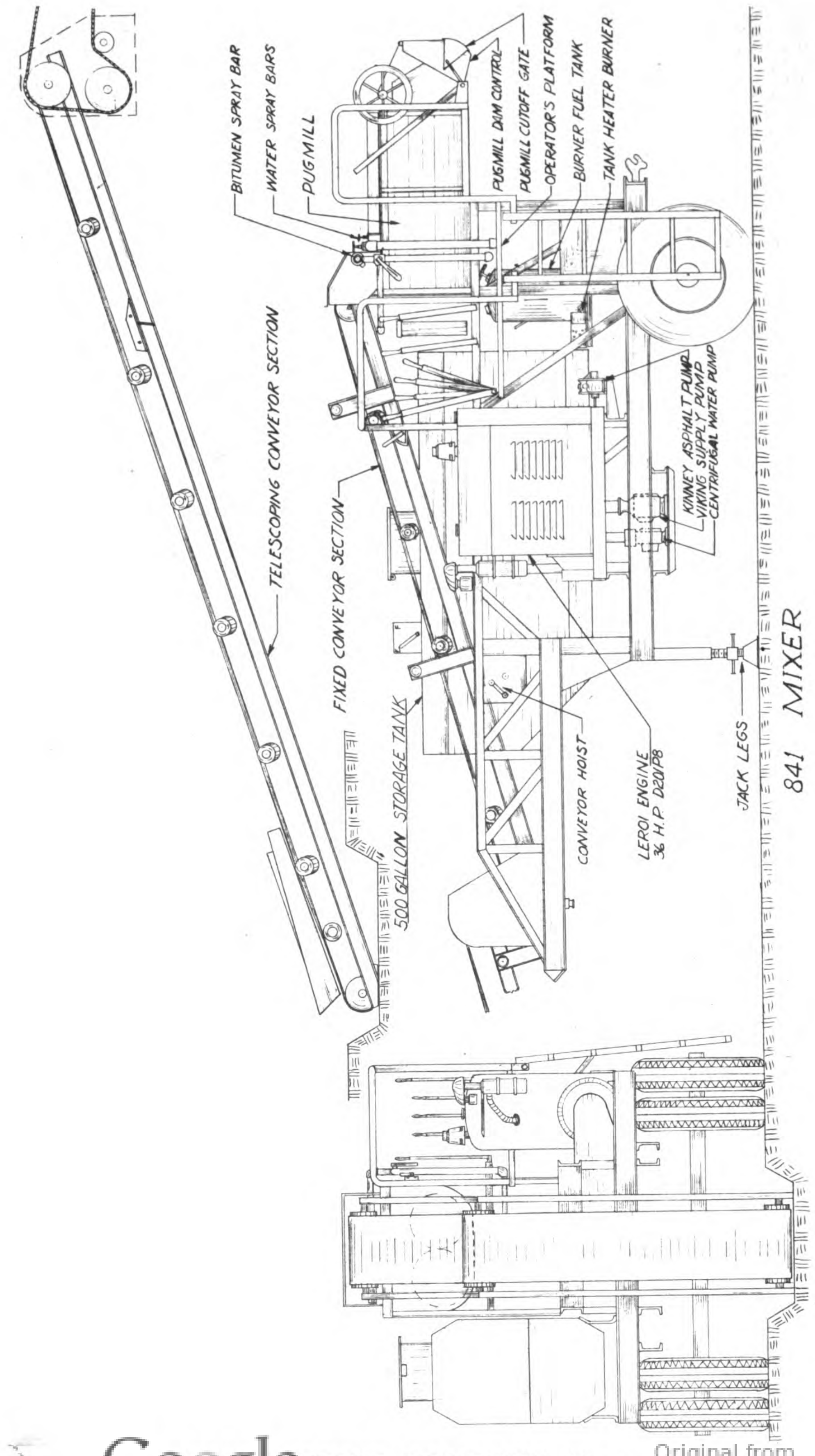
When raising or lowering the telescoping section, it is necessary to slip the drive chain on or off. This chain drives both belts at the same time through sprockets on the foot shaft of the fixed section and on the head shaft of the telescoping section. It is not necessary to "break" this chain; a weighted idler takes up enough slack so that whenever the telescoping conveyor is just a few feet from operating position the idler may be lifted and the chain slipped on or off the sprockets.

The telescoping section has a small hopper fastened to the foot end for receiving the aggregate as it is discharged from either the Dryer or the Soil Unit. Grizzly bars over this hopper keep out oversize stones, roots, or other foreign material.

The telescoping section is quite long and when it is raised, this section "breaks" so the upper portion can swing down and be fastened to a support over the pugmill. To break the conveyor, a KEEPER PIN is taken out at the pivot point just over the spray chamber, and this same pin is used to fasten the section down to a support at the end of the pugmill.

The fixed section of the transfer conveyor also has a small hopper at its foot end. In this case, however, it receives the material as it is discharged from the telescoping section. This second belt carries the material and discharges it into the pugmill.

The rubber belt in both sections is 18" wide, designed to handle the hot aggregate from the 831 Dryer. The rubber belt can withstand temperatures up to 350° F. without suffering serious damage as long as the belt is in operation. While moving, the belt has a chance to cool on its return run while not carrying hot material. If for any reason it becomes necessary to stop the belt always be sure to get all hot material off before stopping because if the belt is left standing covered with hot material, the heat after a short period would penetrate into the belt to cause blisters or breaking of band between the rubber cover and the canvas base. For long belt life try to keep the temperature of the aggregate as low as practical for good mixing.



841 MIXER

FIGURE 29

The belt is supported by troughing roller carriers spaced every few feet, and several return rollers on the underneath side. Both sections of the conveyor are driven together as described. The drive pulleys are held in place by take-up screws so that they may be adjusted to get the proper slack and alignment in the belt. Also, the troughing carriers are mounted in frames which are slotted so they may be shifted slightly to align the belt.

Adjustment

To adjust the conveyor belts so they will run true on the troughing carriers and on the head and foot pulleys, the following adjustments can be made:

If the belt runs about true on the head and foot pulley but runs off the carriers to the right as one looks up the conveyor, then the right side of the carriers should be moved slightly forward in the direction of belt travel to correct the misalignment. If the belt travels to the left then the left side of the carriers must be moved ahead. The carrier frame has slotted holes to permit such adjustment. Should the carrier be all the way forward on the hold down bolt and the belt still runs to the right, for example, then the opposite side of the carriers can be moved down or opposite to travel of the belt to correct the misalignment.

Both head and foot shaft pulleys should be square or at 90° to the frame and belt. However, if the belt continues to run off the head pulley then the adjusting screws must be turned to center the belt on the pulley. This operation will bring the belt to the left or towards the center of the pulley.

The top conveyor (telescoping conveyor) has the screw adjustment at the head end while the lower conveyor (fixed conveyor) has the take-up screws at the foot end. If the belt runs off the fixed pulley on either conveyor, its direction or movement can be changed by adjustment of the carriers or return rollers as described above. These two pulleys are set square to the frame and cannot be moved.

When all adjustment has been taken and the belt becomes loose, it will be necessary to cut out a section of belt and put in new lacing. Be sure to cut the belt square, otherwise it will not run true on the carriers, head, and foot pulleys.

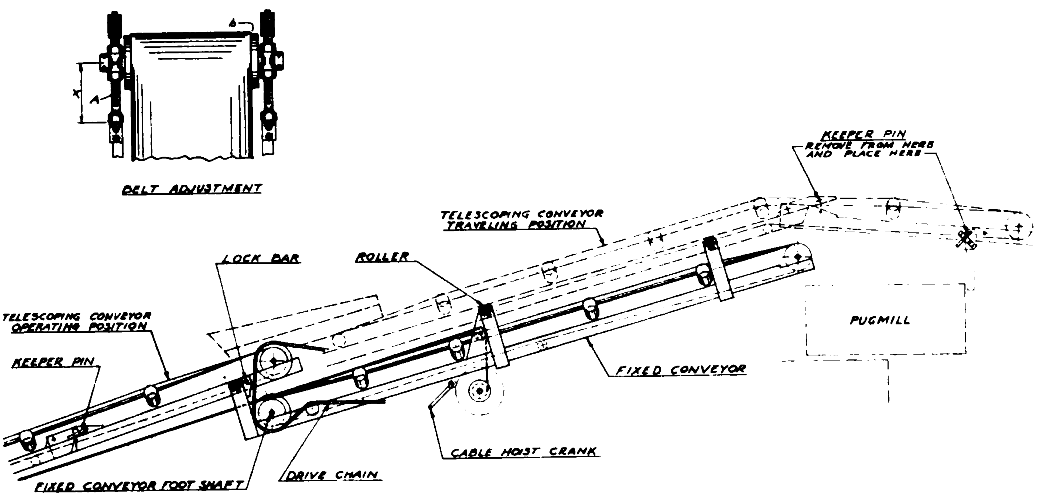


FIGURE 30

Pugmill

Function and Operation

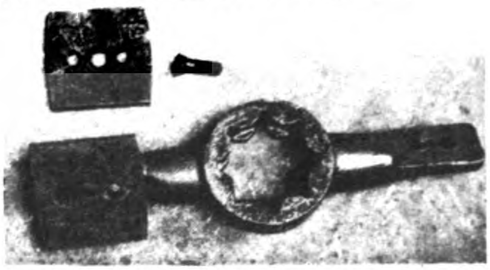


FIGURE 31
Pugmill Arm and Paddles

FIGURE 32
Pugmill Liner Plate

The mixing action, which is the basic process in both plants, is produced in the pugmill, which consists of a curved steel shell in which twin paddle shafts rotate in opposite direction to each other or from outside to center as shown by arrows in Typical Paddle Setting drawing, Fig. 33. The process is continuous; unmixed materials are fed into the pugmill, mixed thoroughly by the rotating paddles, and discharged as a uniform, finished mix.

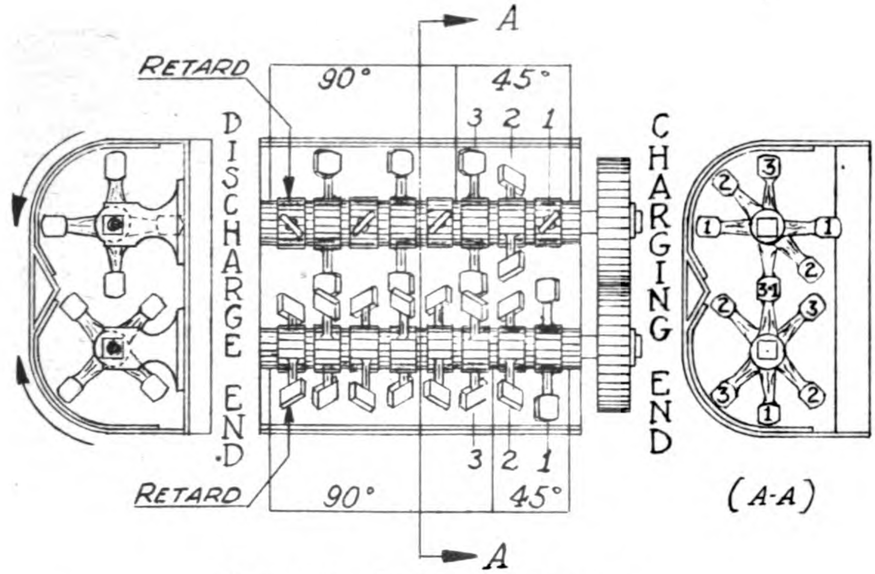
Each square paddle shaft is fitted with eight arms (Fig. 31) on which paddle tips are bolted at such an angle that, as the paddles revolve, each tip forces a small portion of the mix toward the discharge end of the pugmill. The pressure that results from this interlocking movement of the paddles, plus the length of time each particle remains in the pugmill, determines the degree of mixing.

Some materials are harder to mix than others; therefore, it is necessary to be able to vary the degree of mixing so it will be satisfactory for all types of mixes. This is done by changing the setting of the paddles to increase or shorten the mixing cycle or by damming the flow of material by raising the discharge dam control.

The typical setup for this plant will involve mixing materials which should be fairly easy to mix. Therefore, the paddles can be set to give a comparatively short mixing cycle. Aggregates which contain a large amount of fines, will be harder to mix satisfactorily, requiring a different setting.

The paddle arms are constructed like an eight-point socket wrench so that they may be mounted on the square shaft at either 45 degrees or 90 degrees to the next paddle. See (Fig. 31) above and (Fig. 33).

The 45 degree setting forms a spiral which keeps the material in the pugmill only a short period of time. Therefore, unless the material is unusually easy to mix, it is usually necessary to increase the length of the mixing time by changing some of the paddles to 90 degrees. When changing the setting of the paddles, change the ones at the DISCHARGE end first, working back toward the charging end as additional slowing up is required. It is not advisable to set all the paddles at 90 degrees; the first two on each shaft should be left at 45 degrees. When changing paddles keep chain or wire around shafts holding them up to prevent undue strain on pugmill gear teeth, also it is advisable to keep paddle arms off each shaft in separate pile to avoid confusion and possible error in reassembly which if not noticed would make it necessary to do job over again.



TYPICAL PADDLE SETTING

FIGURE 33

The last paddle on each shaft at the discharge end should always be set at 90° and reversed (Marked "Retard" in Fig. 33 above).

However, if after setting the rear six paddles on each shaft at 90 degrees, the material is still not coating or mixing properly or if there are lumps to be broken up requiring additional mixing it is possible to reverse one or two more paddles at the discharge end to further lengthen the mixing cycle. This is done by transferring a paddle from one shaft to the other.

When a paddle is reversed it faces towards the material and when rotating the paddle face tends to move the material away from the discharge end of the pugmill thus retarding the action or flow through the pugmill.

It is important to remember that whenever the paddles are set to increase the mixing time, the pressure is correspondingly increased, which means that more power will be required for this greater load and that the paddle tips and liner plates will wear out faster. If, after changing the setting of the paddles, the load becomes too great for the engine, it will be necessary to cut down the capacity; in other words, pass less material through the pugmill. It is important to remember that in the Mixer the capacity is proportional to the degree of mixing which, in turn, is proportional to the power available.

The bottom, sides and charging end of the pugmill are protected against wear by replaceable steel liner plates. Two curved liner plates (Fig. 32) protect the bottom and sides from abrasion. They are reversible and inter-changeable as well as replaceable to provide added wear. The discharge end of the plates will wear out first; therefore, they should be checked daily, and unless fairly well worn, reversed or interchanged to get all the wear possible. Flat liners protect the charging end from wear, but they will outlast two or three sets of curved liners.

When mixing cutback asphalts in the pugmill, it is important to keep all flame away. However, sometimes the fumes from the cutback may catch fire in the pugmill, possibly from overheated aggregate. If that

should happen, simply turn the spray valve so the bitumen will circulate back to the tank instead of spraying, leaving the aggregate feeding into the pugmill to smother the fire.

After a mixing job is finished, it is important to clean out the pugmill so that the material will not harden and cause damage to the drive the next time the pugmill is started. Also, changing of the paddle setting and liner plates is made a difficult job if material is left to harden.

Adjustment

SETTING PADDLES

To make a change in the setting of the paddles, it is necessary to start at the discharge end and strip the paddle shafts up to the paddles to be changed. The rear bearings, dirt seals and bushings must all be removed before the paddles and spacers can be pulled off. When changing the paddle settings, it is necessary to work on both shafts at once, making sure the timing is correct when replacing so that no two paddles will strike each other.

The paddle tips and liners should be checked daily for wear. The tips are replaceable and can also be turned around to wear on both edges. If the bolt shows wear, use a new one to keep from losing the tip, which might result in wear on the paddle arm which is costly and relatively difficult to replace.

REPLACE LINER PLATE

To replace or change liner plates, scrape all material off the plates so the bolts can be removed. It is necessary to take off the truck discharge hopper to slide the plates out. When replacing, use new bolts and be sure that the heads fit into the counter sunk holes.

Discharge Gates

Function and Operation

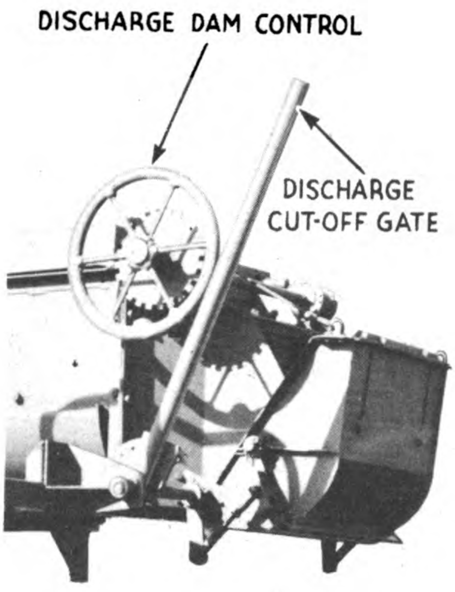


FIGURE 34

Pugmill discharge gate and lever

There are two discharge gates located at the discharge end of the pugmill, (Fig. 34). One is the DISCHARGE DAM CONTROL which is a hopper-like gate for varying the resistance to the flow of material in the pugmill. It rotates around a pivot point and is controlled by a cable and hand wheel which has a ratchet and lock for holding the gate in any position. By raising or lowering the discharge dam control unit the flow of material in the pugmill can be slowed up or allowed to flow faster, thus Manual Control of time of mixing can be maintained. This unit should be kept as low as possible while still obtaining a good mix to avoid excessive wear and unnecessary load on engine.

The CUTOFF GATE is curved sliding plate which covers or uncovers an opening in the discharge dam control. It is controlled by a long lever and is normally left open when mixing, being shut only to stop the flow temporarily, usually for changing trucks underneath. If it takes longer than about fifteen seconds to change trucks, the gate must be opened or the plant will have to be stopped, for the hopper section of the discharge dam control cannot hold much material.

Adjustment

The discharge gates require little maintenance, the only adjustments being to change the position of the cutoff lever. This is done by changing the bolt on the quadrant plate to suit the convenience of the operator. The gates should be locked tightly before traveling to keep them from being damaged.

Bitumen Metering System

Function and Operation

The bitumen metering system includes the KINNEY pump and PIPING (Fig. 35) which is used to add bitumen to the materials in the pugmill.

Starting from the tank outlet, the bitumen flows through the three-way valve "A" down to the strainer; valves "B" and "C" being shut. See (Fig. 36) below. The bitumen then flows through the pipe to the Kinney metering pump. From there it is pumped up to the spray bar control valve. If this valve is open to the spraybar, the bitumen passes into the spraybar is sprayed out through the nozzle into the pugmill.

The spraybar control can also be turned to send the bitumen back to the tank when it is not desired to spray. This is necessary when starting to mix so that the pump can be operating and the bitumen quickly turned into the spraybar the second that the aggregate is discharged into the pugmill. It is important that this spraybar control valve never be turned so as to shut off the line completely, for the Kinney pump is of the positive displacement type and cannot operate if the discharge is closed.

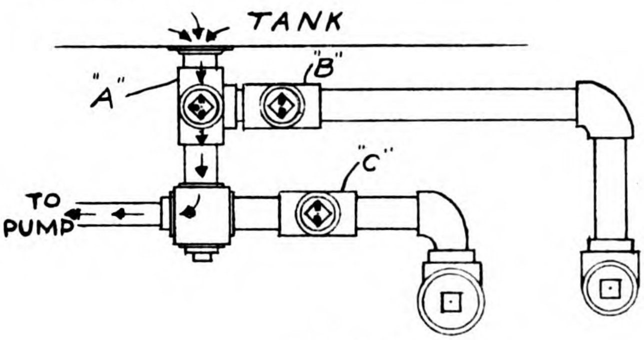


FIGURE 36

Position of Valves Using Kinney Pump

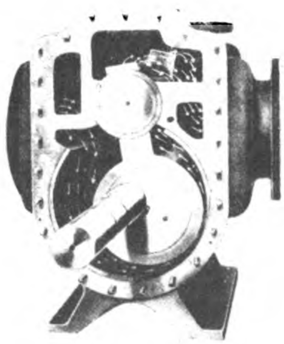


FIGURE 37

Kinney Metering Pump

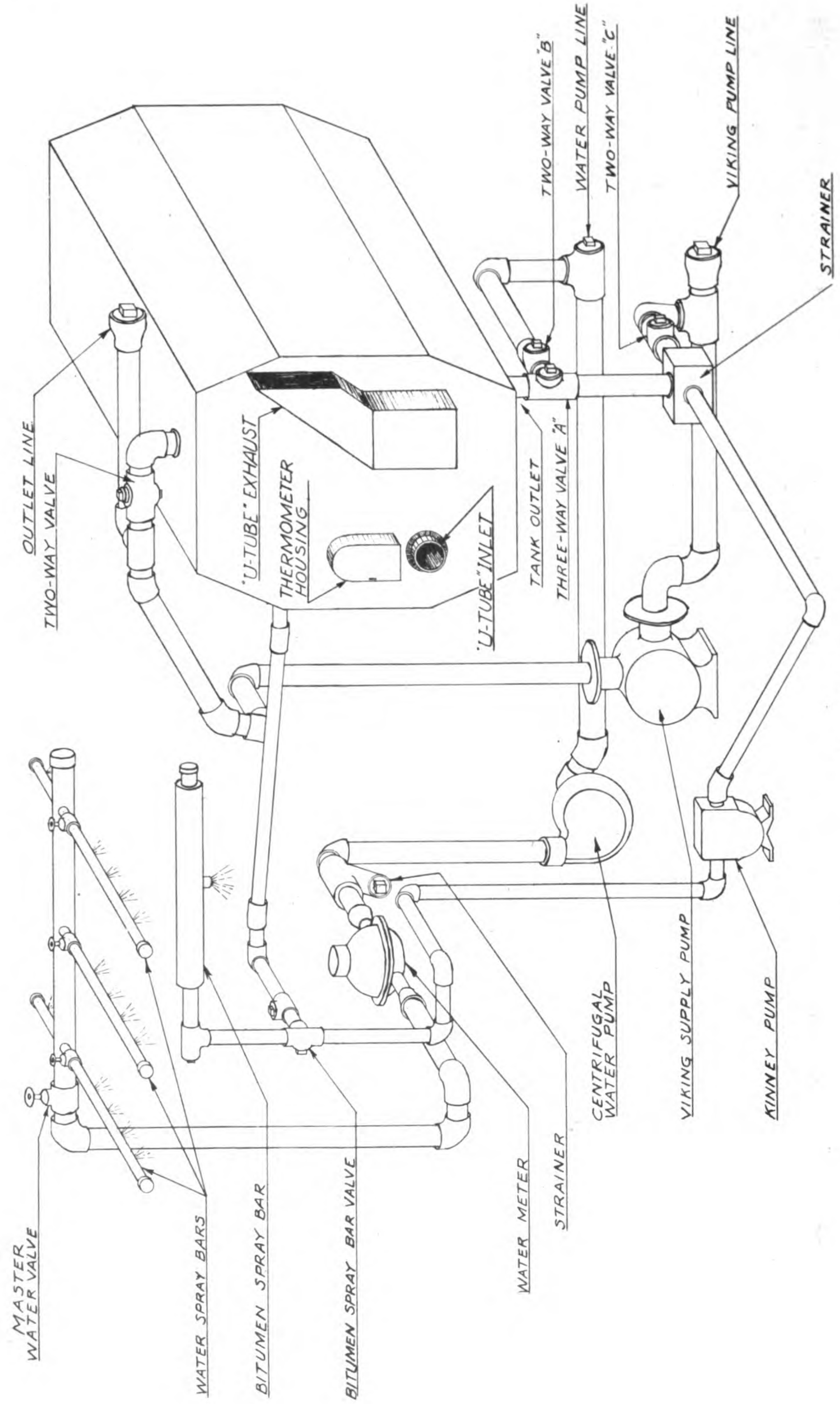


FIGURE 35

Bitumen and Water Circulating Systems.

The 1-1/4" Kinney pump (See Fig. 37) has a capacity of from 2 to 8-1/2 gallons per minute. The capacity depends upon the speed of rotation. Since the engine speed is constant, the speed is varied by changing the sprockets which drive the pump. Nine sizes of sprockets are available for the pump shaft and two sizes of driver sprockets on the pugmill pinion shaft. Therefore, eighteen different speeds or capacities are possible. Capacities for these sprockets as used with either driver sprocket are shown in "Construction Information" on table 11.

It is necessary to remember that the bitumen must be fluid enough to pump. Some asphalts require heating and Table 12 under "Construction Information" gives the correct temperatures. The piping and spraybar are steam jacketed for heating with steam if asphalt is left in the line during shut downs or over night. The pump is not piped for steam and may require heating with a torch if difficulty is encountered in starting. However, the pump and lines should always be drained since steam might not be available.

If the pump is started when the bitumen is cold and stiff, damage to the pump will result. A shear bolt (4) (Fig. 38) through the pump sprocket is provided as a safety measure, since it will break when load is too great. This is a standard 3/16" x 1-1/4" hex head cap screw. Whenever this bolt breaks, it is a warning of trouble somewhere - the asphalt is too cold and stiff, or foreign material may be in the pump; therefore, the trouble should be corrected before trying to cintinue to operate. If the flow from the nozzle is not steady and uniform, the strainer should be checked to see if it is clogged, or possibly the outlet may be clogged inside the tank. Sometimes an air leak in the line will also cut down the flow. It is necessary to keep the strainer clean at all times and this should be checked before every run. The spray nozzle on the spraybar should also be cleaned after using.

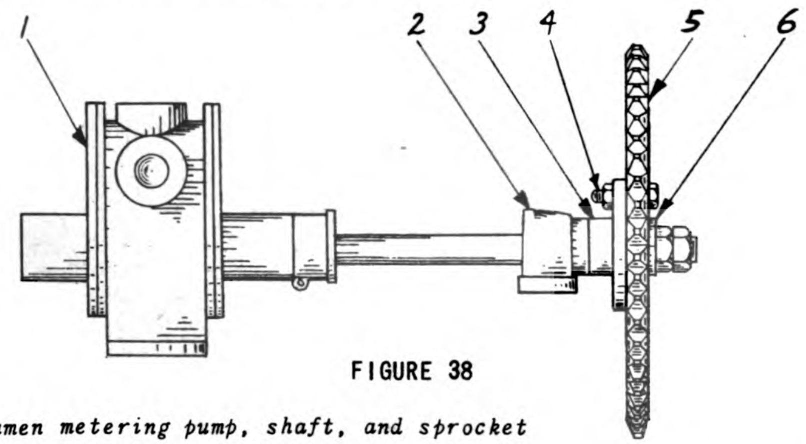


FIGURE 38

Bitumen metering pump, shaft, and sprocket

When operating the matering pump, be sure to turn the valves correctly. Do not run water through the Kinney pump, since water does not have the natural lubricating qualities that bitumen does, and will damage the internal mechanism of the pump.

In case water does get into the Kinney pump and in the piping, the pipes should be broken apart and all water drained out then reassembled and asphalt or lubricating oil run through to get the water out of the pump and out of the pipes to prevent corrosion.

If pump is to be left standing for some time without operation, fuel oil should be run through it to insure getting out the asphalt or softening it so that pump can be started with ease when operations are started again. Two pipe plugs in top of pump can be removed to put in fuel oil or kerosene to soften asphalt in the pump.

Adjustment

HOW TO CHANGE SPROCKETS ON THE KINNEY PUMP

The speed and therefore the capacity of the Kinney pump is varied by changing the driver sprocket or the pump sprocket. There are two sizes of driver sprockets, both of which are of the split type so that they may be replaced easily on the pugmill pinion shaft without disturbing any other part of the shaft. The pump sprocket (5), (Fig. 38) fits on the end of the pump shaft and is secured to a hub (3) by a 3/16" x 1-1/4" hex head cap screw, (4) nut and lock washer which acts as a breaker bolt to protect the pump foom overload.

To change the pump sprocket it may or may not be necessary to break the chain depending upon the difference in size of the sprocket already on the pump and the one to be used; and the amount of adjustment possible with the Kinney pump idler sprocket. If the difference in size is too great, it may be necessary to break the chain and remove several links, or add links if a larger sprocket is to be used. The same is true of the driver sprocket.

To remove the pump sprocket, loosen chain and unscrew the two hex nuts on the end of the pump shaft, slide off the loose washer (6) and remove the breaker bolt (4) which will then allow the pump sprocket (5) to be slid off easily. Replace with desired sprocket and replace bolt, washer and nut, adjusting the chain with the idler.

To change the driver sprocket, on the Pugmill Pinion Shaft, remove the four cap screws lockwashers and two lock plates near the outer edge of the sprocket and the six machine bolts, nuts and lock washers which fasten the two halves of the sprockets to the hub. Replace with other size, install bolts and adjust chain.

The metering pump is equipped with a packing gland at the point where the shaft enters the pump housing. This gland consists of packing which is held in place and compressed by a Spanner nut. The purpose of the seal is to prevent any leakage of bitumen out around the pump shaft. Do not tighten this Spanner nut too tightly, or excessive heat will result.

CLEANING STRAINER

To clean the bitumen strainer, remove the plug from the bottom of the box, (see Fig. 35) take out the screen, and wash it in gasoline. This should be done at least once or twice a week or whenever changing asphalt or cleaning out the tank. Never use flame to clean strainer since it is soldered and will not stand intense heat.

Bitumen Supply System

Function and Operation

The supply system includes the VIKING PUMP and PIPING (Fig. 35) which is used to fill or empty the storage tank and to circulate the bitumen when it is heated in the tank. The same system is used for either water or asphalt.

TO FILL TANK

If it is desired to fill the tank, the outside supply line is connected to the Viking pump line, at "E" and the two way "F" (Fig. 35) valve at the top of the tank is opened, and valve "C" at bottom is closed as in (Fig. 40) below. The bitumen is then sucked in by the Viking pump and pumped up through the valve on top and into the tank.

TO EMPTY TANK

If it is desired to empty the tank of bitumen, valves "A" and "C" are opened and valve "B" is closed as in (Fig. 39) and the valve "F" on (Fig. 35) on top of the tank is closed. The outlet line "G"

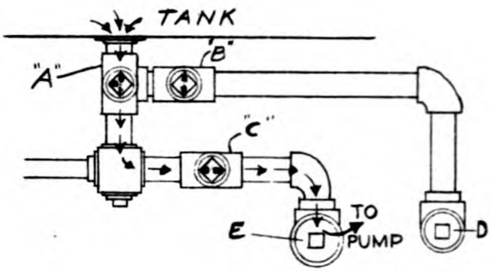


FIGURE 39

Position of Valves Using Supply Pump to Empty or Circulate

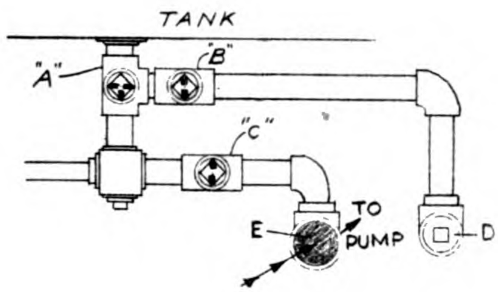


FIGURE 40

Position of Valves Using Supply Pump to Fill Tank

(Fig. 35) is connected to an outside tank which is to be filled. Then the Viking pump sucks the asphalt out of the mixer storage tank and discharges it through the line.

CIRCULATING BITUMEN

When it is desired to circulate the bitumen while heating, valves "A" and "C" are opened and valve "B" is closed as in (Fig. 39) and valve "F" (Fig. 35) at the top of the tank is opened and the plug inserted in the outlet line "G", sending the asphalt back in the tank.

The Viking Pump is a positive type rotary gear pump; therefore, it is important that the discharge should not be closed off when pump is running. Also, the asphalt must be fluid enough to flow easily, otherwise the pump will be damaged. However, a shear bolt in the pump sprocket protects the pump from too great a load. This is a standard 1/4" x 1-1/2" hex head cap screw.

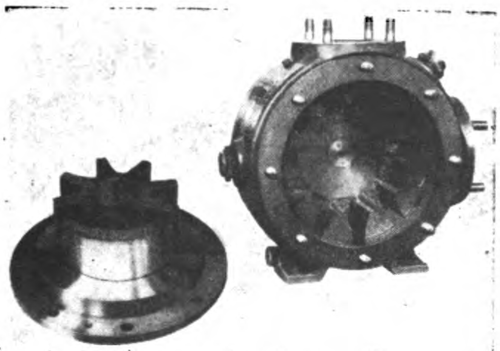


FIGURE 41

The Viking supply pump is used to fill or empty the storage tank and to circulate the bitumen when it is heated in the tank. The same system is used for either water or asphalt. This is for supply only and is not used for adding bitumen or water to the mix.

Adjustment

The Viking pump should be drained after using. After pumping asphalt, fuel oil should be added to prevent asphalt setting up so the pump will not stick. After pumping water, drain and add lubricating oil to prevent corrosion. If the shear bolt should break while pumping, be sure to check whether it is because the asphalt is too stiff or whether it is because some foreign material is in the pump before replacing shear bolt and starting pump again.

Water Supply System

Function and Operation

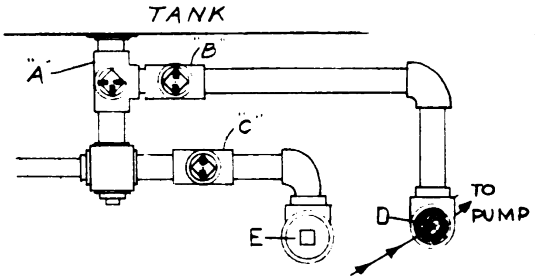


FIGURE 42

Position of Valves with Water Pump Connected to Outside Supply.

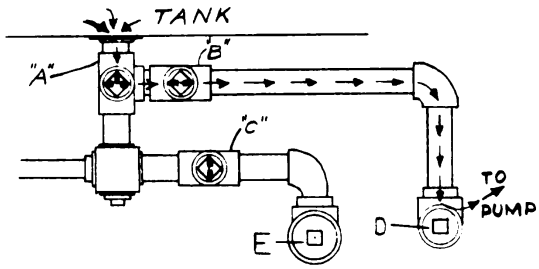


FIGURE 43

Position of Valves with Water Pump Connected to Mixer Storage Tank.

Application - This system is provided so that the mixer may be applied to soil-aggregate construction, utilizing clay and water to stabilize aggregates. This system functions with water supplied from the Mixer Storage Tank, or an outside source of supply, with Water Pump, Strainer, Water Meter and Water Spray Bars for control and supply of water to the Pugmill.

Pump - This is a centrifugal type unit with a pipe line which will draw water from the mixer storage tank through valves "A" and "B", (Fig. 35), or connected to an outside source of supply at "D".
Mixer Storage Tank Water Supply - Be sure that Viking Supply Pump lines and tank are thoroughly cleaned so that asphalt will not clog the water Pump, and make necessary disassembly and cleaning of the pump. To fill the tank, the Viking supply pump is used. To fill the tank close valve "C" and turn valves "A" and "B" to positions shown on (Fig. 42). Open valve "F" above the tank (Fig. 35) and connect water supply to Viking Line at "E".

Caution: Be sure valve "C" is closed and valve "A" is in the position indicated on (Fig. 42) to keep water out of the metering pump and lines. In the event water does enter the pump and lines see discussions under "Bitumen Metering System" to supply water from the Mixer Storage Tank to the Pugmill, valves "A" and "C" remain in the positions described above, and valve "B" is opened as shown on Fig. 43 above. Do not operate the water pump with Spray Bar valves closed as this will cause heating and damage to the pump. To drain water from the tank valves, "A" and "B" must remain in positions shown on (Fig. 43) and plug at "D" on water pump line removed.

Outside Water Supply - Connect source to water Pump line at "D" with valves "B" and "C" closed as shown (Fig. 42). Be sure Spray Bar Valves are open before operating pump.

Water Meter - Fig. 44 this records the amount of water pumped to the Pugmill, in gallons, on a register and dial.

To obtain a reading, record the figures on the register, including the two dead zeros on the right hand side and add to the register figures the reading on the small dial. To determine the gallons pumped during a given period a reading must be taken at the start of the period and substracted from the reading taken at the end of the period. The difference is the amount pumped in gallons.

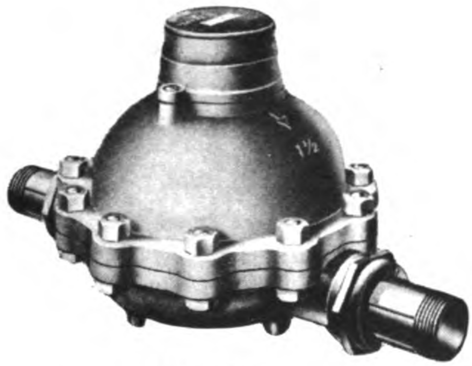


FIGURE 44

Water meter which records amount of water pumped to the pugmill

Spray Bars - Three water Spray Bars are mounted over the Pugmill, with holes provided for water outlet spray. The water flows to the Spray Bars through a Master Water Valve, (Fig. 35). Each Spray Bar is equipped with a valve for regulating the flow of water.

Adjustment

The Water Pump is equipped with a packing gland to prevent leaking around the pump shaft. If a leak develops tighten this nut 1/4 turn at a time until it stops. A small drip is not objectionable. Do not tighten the packing gland too tight as this will cause the shaft to heat and score.

The Water Strainer should be cleaned thoroughly as often as necessary, by removing the plug at the bottom, removing the screen and flushing with water. Do not operate water system with screen removed.

The Water Meter may need occasional cleaning. See Accessory Section. Caution: Do not allow asphalt to get into the meter.

Storage Tank

Function and Operation

A 500-gallon capacity STORAGE TANK is mounted on the side of the Mixer and may be used either for water or bitumen. A large manhole is located in the top. Plugs at each end of the tank are used for draining and cleaning. A U-Tube flue inside the tank near the bottom is provided for heating the bitumen with the tank Heater Burner. A thermometer is housed at one end of the tank to show the temperature of the bitumen. (See Fig. 35).

Adjustment

Since the mixer supply tank can be used for both asphalt and water, it is important to flush the tank thoroughly after use and drain well. If any water is left in the tank, it will cause the asphalt to foam violently when heated, therefore, the tank should be dried thoroughly before using asphalt. If asphalt has been used, the tank should be flushed out with fuel oil; or, if tar has been used, flush with creosote oil. This is easily done by pouring a few gallons in the tank, circulating with the Viking Pump, and then draining. The Mixer should never be trailed with any quantity of material in the tank.

Tank Heating System

Function and Operation

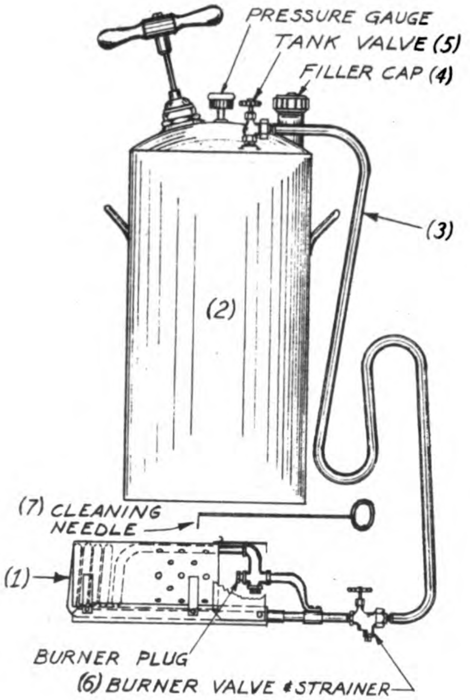


FIGURE 46

Aeroil Tank Heater Burner and Fuel Tank

The TANK HEATER BURNER (Fig. 46) is an Aeroil torch-type distillate burner. The fuel and air are pumped together through heated coils which vaporize the fuel so that the burner plug emits a spray which burns instantly. The burner is placed on the bracket so that the flame enters the left end of the U-tube, the heat passing through the tube and out the exhaust. Whenever the burner is used, the asphalt in the tank must be circulated with the Viking pump.

CAUTION: This burner should be used ONLY for keeping asphalt at pumping temperature, NEVER for doing all the heating except after emergency shut downs. It must not be used when the level of the asphalt in the tank is below the top of the U-tube. The naphtha or kerosene fumes from cutbacks are inflammable: therefore, care must be exercised to keep any flame away. Be sure that the level of asphalt is not below the level of the thermometer, otherwise it will not register correctly and it will be impossible to determine the temperature of the asphalt.

To Operate Burner:

1. Unscrew filler cap (4) Fig. 46 and fill 20 gallon tank to within about four inches of the top with fuel.

   NOTE: Use kerosene for fuel in this burner. If kerosene is not available diesel fuel may be used as a substitute. Diesel fuel is not as satisfactory as kerosene as it will cause the burner coils to become loaded with carbon making necessary more frequent replacement of coils.

2. Screw down filler cap (by hand) very tight, and see that all hose connections and other fittings hold air or fuel under pressure.

3. Be sure the valve (5) on the tank is closed and the regulating valve (6) on the burner or torch is closed. Pump air into the tank until the pressure gauge indicates 40 pounds of pressure, then open the tank valve one full turn. Do not allow the pressure to go below 25 pound at any time.

4. To light burner or torch, open the regulating valve on the burner or torch very little, and fill the priming pan one quarter full of fuel by deflecting a stream of fuel down into the pan with a piece of cardboard or metal. Place a piece of rag, burlap or waste in the bottom of the pan to serve as a wick. Close the valve and light the wick. Allow the burner or torch to pre-heat for about five minutes.

   CAUTION: Do not be confused when the burner "blows" after a minute or so during pre-heating period. This is caused by the heated fuel in the coils being vaporized and does not mean that the burner has preheated long enough. To determine if the burner is sufficiently heated, open the burner valve slowly. If the burner plug releases a dry oil vapor and produces a steady bluish flame with no indication of spitting raw fuel, it is ready for operation. Otherwise, continue to pre-heat as before. (For best efficiency, always use the cleaning needle (7) on the burner plug immediately after pre-heating, and before the burner is placed in operation.)

   NOTE: When using diesel fuel oil the flame will be orange.

5. When pre-heated, open burner valve (6) slowly and operate with a small flame for a minute or two, then the valve can be opened to one-quarter to one-half turn, or a little more if necessary.

   CAUTION: If burner keeps going out, sputtering or throwing raw fuel, it is usually improperly pre-heated or operated with the valve open more than necessary. This allows too much cold fuel to enter the coils, cooling them off and preventing proper vaporization. Regulate the length of the flame by the pressure in the tank and not so much by the valve at the burner. Reduce the tank pressure if the flame is too large, but keep pressure above 25 pounds.

6. Before opening the fuel tank for refilling, or for any other reason, release the air pressure slowly by turning the combination filler cap and air release only about one-half turn, no more. Never unscrew filler cap with your head or body over the top of the tank.

7. Lubricate the pump frequently with S.A.E. #10 oil. If the leather cup washer becomes hard and does not catch, remove the plunger rod from the pump and soften the leather with oil, working it in with your fingers.

   NOTE: If the pump refuses to stay down at the end of a stroke, it means that there is fuel in the pump. This is an indication

that the check valve is out of order and will necessitate removing the entire pump for repair. Leaks in the pump check valve are usually caused by dirt in the check valve seat.

8. When shutting the burner off, first close the tank valve to relieve the pressure in the pressure line. Two or three minutes after the tank valve has been closed, the regulating valve on the burner can be closed to shut off the burner completely.

Substitute Fuels

Equally good results cannot be expected when operating burner with substitute fuels, such as diesel oil and gasoline. The use of these fuels suggests the following cautions, restrictions and limitations.

1. DIESEL OIL: Diesel oil will leave a carbon deposit on the inside of the generating coils, which will reduce efficiency and greatly shorten the life of the burner.

   CAUTION: Due to the high B.T.U. content of diesel oil, as compared with Kerosene, the coils have a tendency to overheat, reducing the life of the burner. Plug, with #42 drill hole, as used for Kerosene can also be used for diesel fuel, if operating pressure is reduced from 25 lbs. - 40 lbs. to 20 lbs. - 35 lbs. Flame, when properly adjusted should be from a blue to a bright orange in color.

2. GASOLINE: Gasolines of all grades and octane ratings are dangerous for use in the burner due to their explosive characteristics.

   CAUTION: The burner must be removed from the machine for starting. Due to the higher expansion of gasoline, raw fuel may vaporize in the asphalt tank "U" tube, and explosion will result when lighting burner. Gasolines containing tetraethyl of lead, when vaporizing in the coils, leave a deposit of lead, which clogs coils, and consequently shortens life and decreases efficiency of burner. Burner plug must be changed from plug with #42 drill to plug with #33 drill and pressure controlled between 15 lbs. and 25 lbs.

Operator's Platform

THE OPERATOR'S PLATFORM is located in front of the engine alongside the pugmill. From this platform, the operator can reach all the controls and levers necessary for operation. A small ladder, which slides under the pugmill when not in use, enables the operator to climb easily to the platform. (See Fig. 47).

Jacklegs

The JACKLEGS (Fig. 28) are provided to support one end of the machine during operation and to enable the machine to be raised or lowered for transferring from tractor or dolly. In travel position, they swing back up under the machine and are held in place by the jack lever.

Operating Levers (See Fig. 47)

1. Master Clutch Lever

The master clutch lever controls all the machinery on the 841 Mixer. The clutch itself is a single plate type friction clutch located in the speed reducer housing on the engine. Always stop the machinery with this clutch before engaging either the pugmill jaw clutch or the conveyor jaw clutch. Engage this clutch slowly to avoid undue strain on machinery.

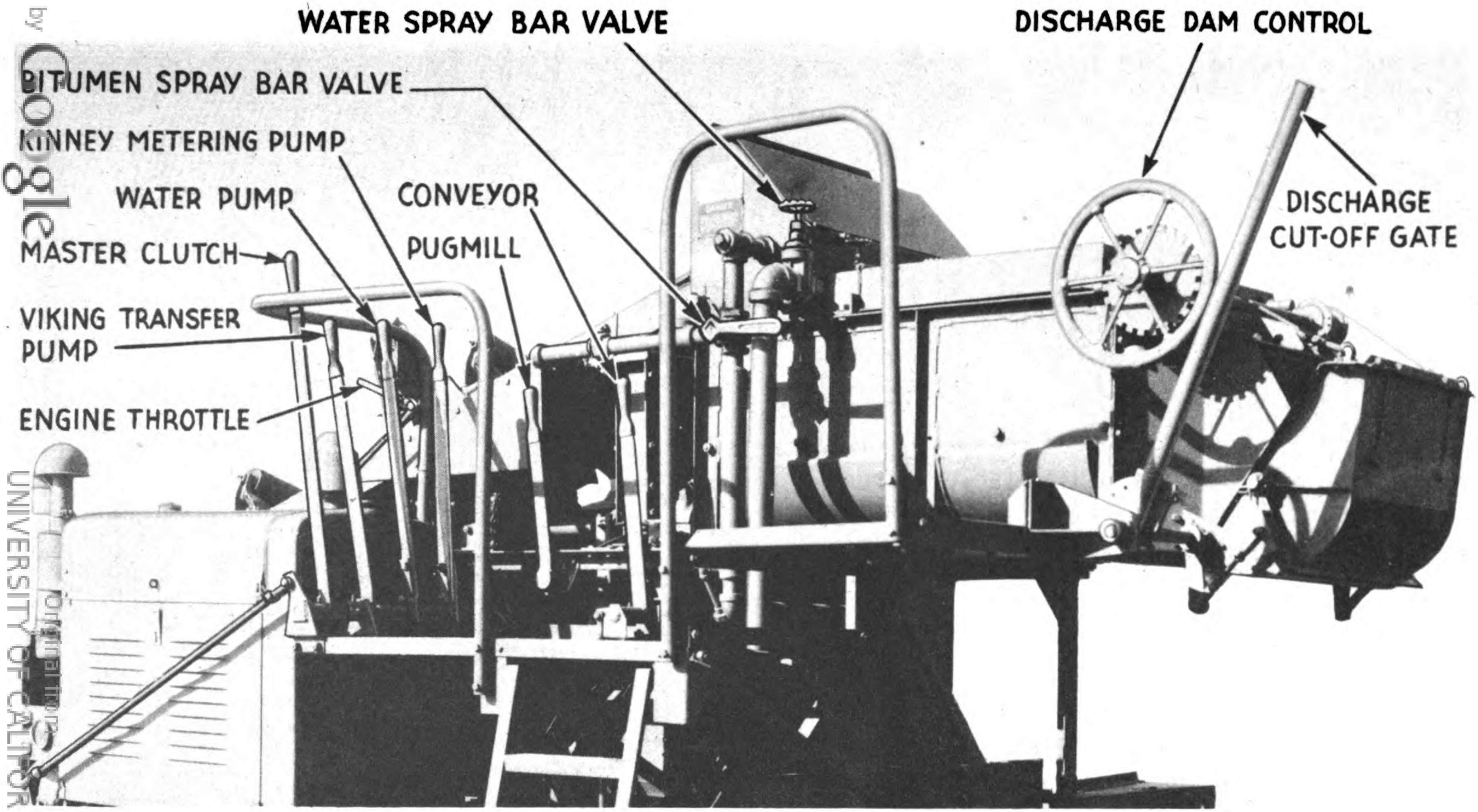

WATER SPRAY BAR VALVE
DISCHARGE DAM CONTROL
BITUMEN SPRAY BAR VALVE
KINNEY METERING PUMP
WATER PUMP
CONVEYOR
DISCHARGE CUT-OFF GATE
MASTER CLUTCH
PUGMILL
VIKING TRANSFER PUMP
ENGINE THROTTLE

FIGURE 47

2. Engine Throttle

The engine throttle control lever has two positions: operating and idling, marked by two notches in the support bracket. The engine should operate at 1400 RPM under full load. After warming up the engine, advance the throttle to operating position before engaging the master clutch. The speed should be checked periodically and can be done easily by counting the revolutions of pugmill shafts which should be 52 a minute.

3. Viking Supply Pump Lever

The Viking pump is controlled by a lever which operates a friction band clutch located on the Main Jack Shaft. This pump can be engaged at any time without disengaging the master clutch. Engage slowly to prevent damage to the pump or breaking the shear bolt.

4. Centrifugal Water Pump Lever

The water pump is controlled by a lever which operates a friction band clutch, located on the Main Jack Shaft which can be engaged without throwing out the master clutch. Engage slowly to prevent straining the belt drive.

5. Kinney Metering Pump Lever

The Kinney metering pump is controlled by a friction band clutch located on the pugmill pinion shaft which allows it to be engaged at any time without disengaging the master clutch. Always engage slowly to prevent strain or breaking the shear bolt.

6. Pugmill Clutch Lever

The pugmill is controlled by a lever which operates a jaw clutch located on the pugmill pinion shaft. It is necessary to disengage the clutch before engaging this jaw clutch to prevent damaging the drive or the clutch jaws.

7. Conveyor Clutch Lever

The conveyor is controlled by a lever which operates a jaw clutch located on the conveyor counter shaft. It is necessary to disengage the master clutch before engaging this jaw clutch to prevent damaging the machinery or the clutch jaws.

8. Bitumen Spraybar Lever

The bitumen flow in the spraybar is controlled by a lever which operates a three-way valve. This valve should always be open either to send bitumen to the spraybar or to the tank; NEVER CLOSED. It does NOT control the amount of bitumen being pumped so it should always be fully opened to either position.

9. Water Spraybar Control

The water flow in the spraybar is controlled by a hand-operated water valve. Three additional valves control the smaller bars which connect to the large header-bar. The amount of water added is controlled by adjustment of the three small valves.

10. Pugmill Discharge Dam Wheel

The discharge dam control is operated by a hand wheel which raises or lowers the dam control by means of cables. A ratchet wheel and dog locks the wheel in any desired position.

11. Pugmill Discharge Cutoff Gate Lever

The pugmill discharge cutoff gate is controlled by a lever which slides by curved gate over an opening in the discharge dam control. The position of the lever can be adjusted to suit the convenience of the operator.

12. Conveyor Hand Hoist Crank

The conveyor is raised or lowered into position by means of a hand operated cable hoist. A safety pawl is provided to prevent the conveyor from getting away from the operator. Several men are required to assist the man who is cranking, by raising and pushing the conveyor back on the support rollers.

13. Mechanical Brake Lever

The brakes used for holding the Mixer in place are operated by a ratchet type hand lever located at the rear of the machine on the operator's side.

Operating Personnel

The operation of the 841 Mixer on bituminous mixing with the 831 Dryer or mixing in conjunction with the 821 Soil Preparation Unit will require a Mixer Operator, Greaser and Helper. This crew of three will be responsible to the Plant Superintendant for the efficient functioning of the Mixer. Qualifications and duties are briefly summarized as follows:

1. Mixer Operator

This man should be experienced in the mechanical operation of heavy machinery and thoroughly familiar with the function, operation and adjustment of all working parts of the Mixer and the coördination of their functions. A background of experience in bituminous and stabilization work is desirable. The operator should be capable of directing the Greaser and Helper in the execution of their duties. His principle duties will be confined to the mechanical control of the machine.

2. Greaser

This man should have some mechanical experience and a knowledge of the functional parts of the machine, their lubrication, and be capable of making mechanical adjustments to the machine as directed by the Mixer Operator.

3. Helper

This man will serve on miscellaneous duties such as handling operating supplies to the Mixer, and cleanup work. He may also be used to guide trucks under the Mixer discharge gate and distribute discharge material within the trucks body. His efforts will be in accordance with the directions of the Mixer Operator.

Machine Operation

Let us assume the Mixer has been set up ready for operation as described under "Plant Set-up". It is now desired to operate the plant. The description which follows pertains only to the actual operation of the Mixer, by the Mixer Operator, with assistance from Greaser and Helper as needed.

Before starting the engine, the machine should be thoroughly lubricated and the engine serviced according to the instructions provided. At the same time, a general checkup is made for possible repairs or damage in traveling.

If bitumen is to be used, the size of the Kinney pump sprockets should be determined for the type of bitumen available by referring to the information and charts provided in the "Construction Information" section. The correct sizes are then installed in the proper manner.

The next step is to check the operation of the machine. Start the engine, allowing it to warm up before running at high speed. Advance the throttle and engage the master clutch, trying out each piece of machinery individually, checking such items as clutches, chain adjustments, and belt alignment.

If it is desired to fill the storage tank, turn the valves as described for filling the tank with the Viking pump and engage the pump. If heating of the tank is necessary, operate the burner, remembering to keep the asphalt circulating. Watch the thermometer, being careful not to overheat the asphalt.

When actual mixing is to begin, start the pugmill and conveyor operating. Remember it is necessary to use the master clutch to do so, since the jaw clutches which control these units might cause jerking and damage. Operate the spray bar pump with spraybar valve set not to spray. When the aggregate starts to flow into the pugmill the valve is quickly opened to spray position, eliminating the time lag which would result if the pump had not already been started. Hold the material in the pugmill until it reaches a normal level, then open the cutoff gate and allow it to discharge into the truck.

Watch the condition of the finished mix to see that the paddle setting and dam control is producing satisfactory mixing, and that the proportions of the mix itself are correct. If not, shut down the plant and make the necessary adjustments.

If it should be necessary to cut off the flow of material completely for a longer period than ten or fifteen seconds, it will be necessary to shut down the plant, since the storage capacity of the discharge gate is comparatively small.

If it is necessary to shut down the Mixer when it is operating in conjunction with the Dryer, the Dryer should be stopped letting the conveyor run long enough to empty the hot aggregate off the belt. As soon as the flow of aggregate decreases, turn the spray valve to circulating position to avoid adding too much bitumen through the spraybar.

To resume operation, simply repeat procedure of starting, waiting until aggregate flows into pugmill before operating spraybar.

After the mixing job is completed, it is necessary to clean out the pugmill thoroughly to keep the mix from hardening to such an extent that the drive will be damaged the next time it is started. The storage tank, piping and pump should be flushed and drained.

If it is desired to travel the Mixer, disconnect the piping and raise the conveyor as described under "Plant Set-up".

831 DRYER UNIT

Aggregate Hopper

Function and Operation

THE AGGREGATE HOPPER (Fig. 51) is a divided steel bin with a capacity of three-quarters of a yard of material in each half.

The purpose of this hopper is to provide sufficient storage capacity to take care of small variations which will normally take place in the feeding of the charging elevator, so that the level of the aggregate can be kept from falling below the tip of the measuring gates. The hopper is divided so that two sizes of aggregate can be handled separately to allow more accurate proportioning.

TELLTALES are mounted on the side of the hopper to indicate when the bins are filled sufficiently, for the convenience of the operator who is on the ground.

Over the hopper are placed GRIZZLY BAR SCREENS which serve to keep out the oversize aggregate, roots and other undesirable material. The screens are held in place by brackets which can be removed if necessary to gain access to the inside of the hopper.

On top of the hopper Discharge Chutes are fastened to direct the flow of materials on the buckets into the bin. These chutes are supported by a hinged arm; the hinged arm and the chutes both swing down into the hopper out of the way for travel.

Also on top at the front of the hopper is fastened an ANCHOR BRACKET used for raising the elevator into position. The hook on the hoist cable is anchored in this bracket when raising the elevator. A GUIDE ROLLER is fastened on each side of the hopper so that the elevator will slide easily up into position.

On the front of the hopper, near the top and bottom respectively, are located the upper and lower PUSH ARMS or angle braces used to hold the elevator in operating position. When not in use, these arms swing back against the hopper and are held in place by bolts.

When operating the machine, it is necessary to watch the level of the aggregate in the bins by watching the telltales (Fig. 50) which swing down when the bin is too empty. The aggregate level must be maintained above the telltales so that the proportions of the mix will not be altered. For best operation the hopper should be kept about 3/4 full. After operations are finished, the hopper should be emptied and cleaned. Material left in the hopper would cause unnecessary traveling weight and might be difficult to clean out if it is rained on or settled.

Adjustment

The hopper requires little attention in the matter of upkeep or adjustment; about the only thing necessary is to be sure the push arms and chute are secure.

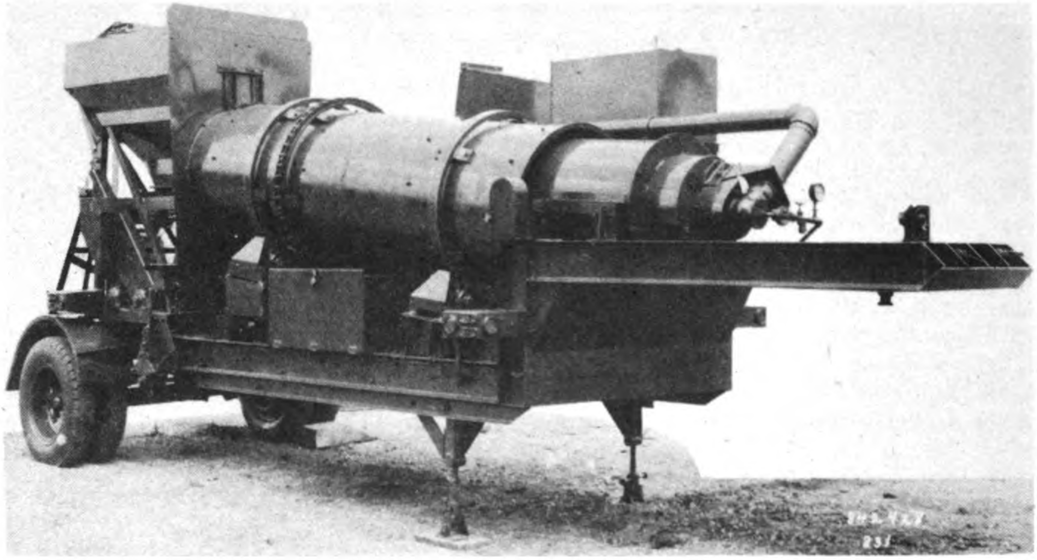


FIGURE 48

Model 831 Single Drum Aggregate Dryer in operating position before raising stack, etc.

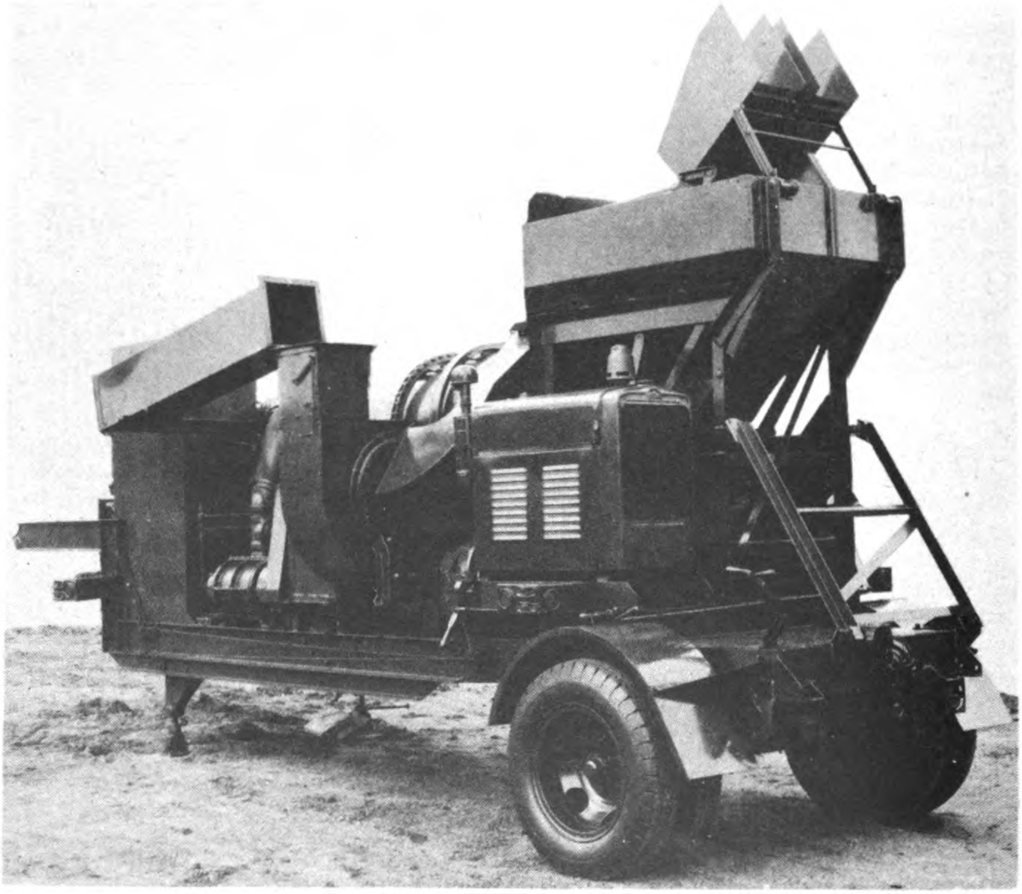
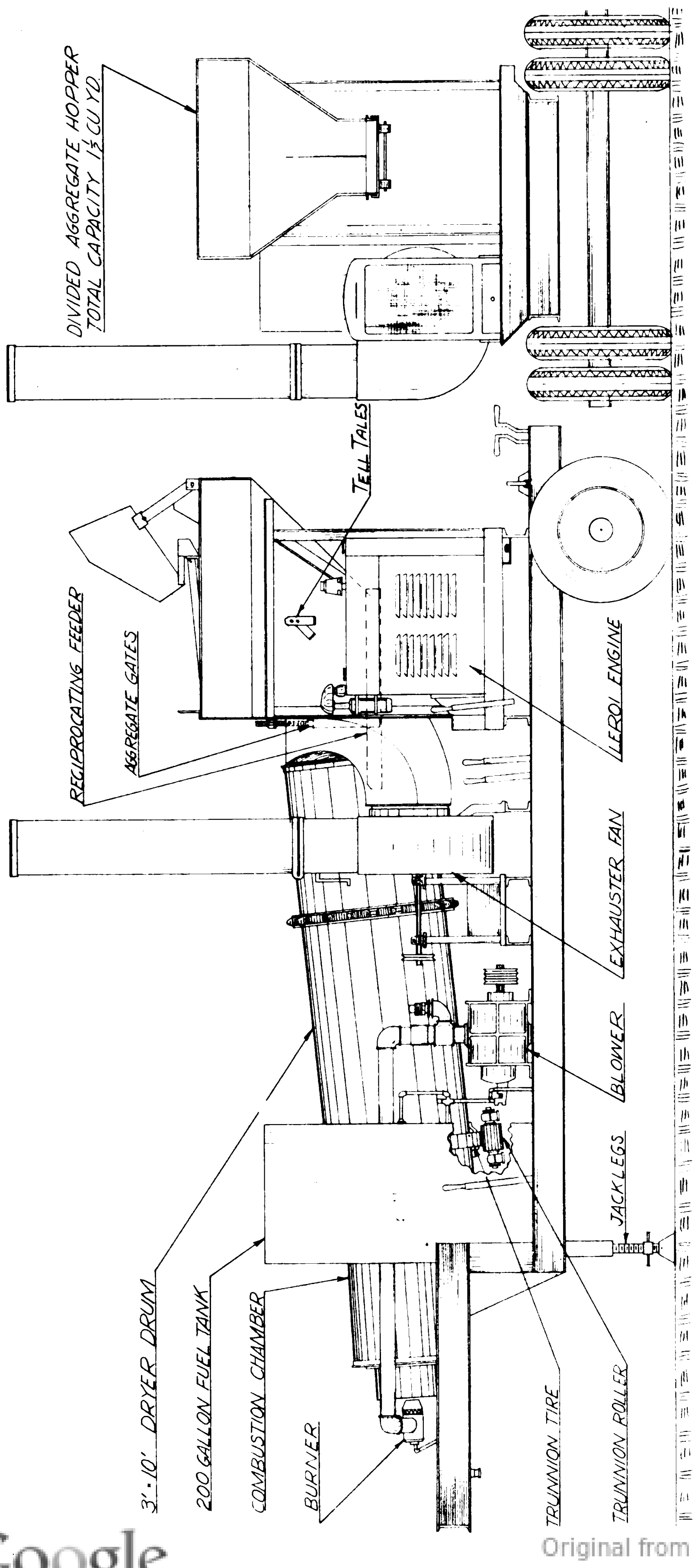


FIGURE 49

Opposite side of Model 831 Dryer.



831 DRYER

FIGURE 50

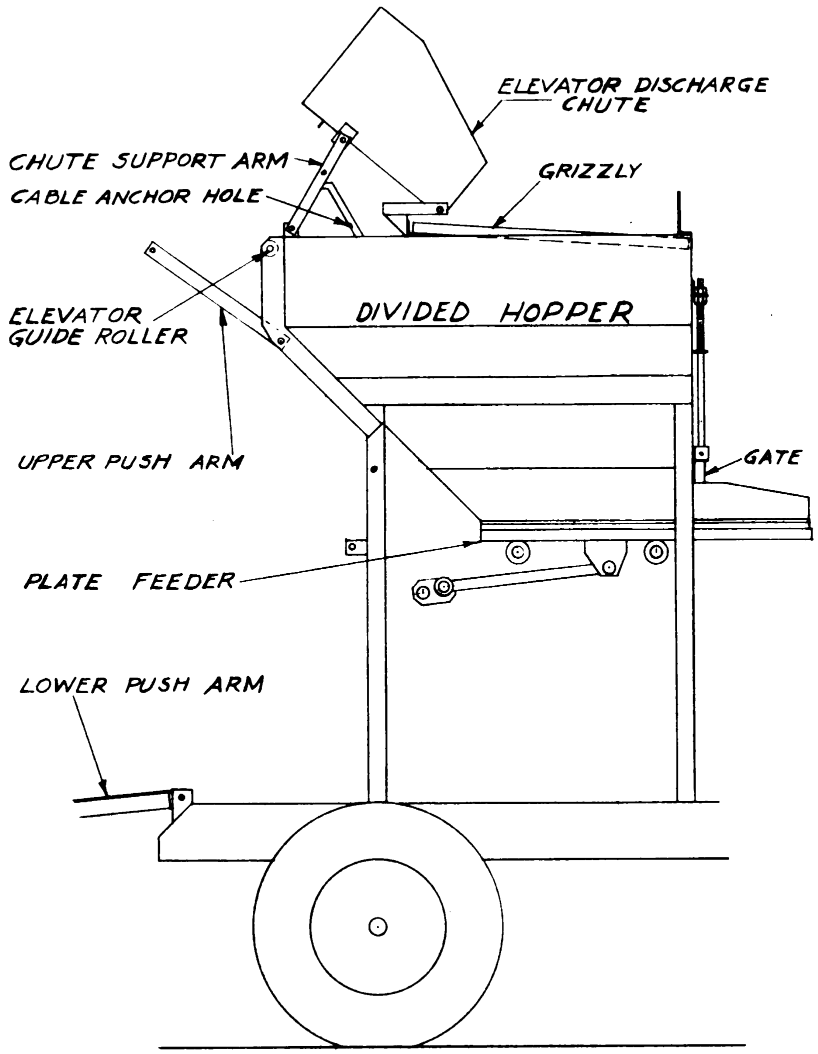


FIGURE 51

Aggregate Hopper and Details

Reciprocating Plate Feeder and Gates

Function and Operation

The RECIPROCATING PLATE FEEDER (Fig. 52) discharges measured quantities of aggregate from the divided hopper through the twin MEASURING GATES (Fig. 52A) into the Dryer drum.

Essentially, the feeder is a steel plate which slides back and forth on support rollers at the bottom of the hopper. The twin gates are operated independently and are constructed of steel plates fastened to long, threaded adjusting screws so that they may be moved up or down over an opening in the hopper. The amount of material being fed out by the plate feeder is controlled by these gates. Since the gates are independently adjusted, any desired amount can be fed out from either side.

The reciprocating or back and forth motion of the plate feeder is produced by a connecting rod attached to the feeder plate and connected on the other end to the feeder crank shaft. This connection is adjustable to give two different strokes; one, a six-inch stroke; the other, a

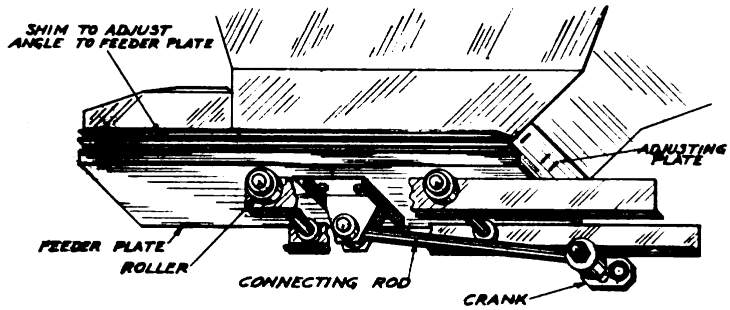


FIGURE 52
Reciprocating Plate Feeder

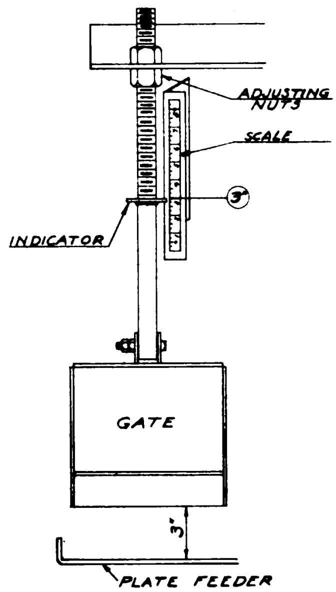


FIGURE 52A
A Measuring Gate

four-inch stroke. The six-inch stroke is the usual connection; the four-inch stroke is used only when one of the gate openings is reduced so that it approaches the maximum size of aggregate, usually below one inch. Then by using the shorter stroke the opening may be increased to assure unrestricted Aggregate flow, remembering to increase the other gate opening proportionately.

To understand the operation of the plate feeder, remember that this plate acts as a bottom for the hopper. Consequently, the weight of the material is directly upon it so that as the plate moves forward, material is carried with it through the gate. As it does so, the remaining material in the hopper slides down to take the place of the aggregate which has been carried forward. When the plate moves back, the material which was carried out cannot come back; instead, it drops off into the drum. Since this action is uniform as long as sufficient material is maintained in the hopper, the aggregate supply is mechanically controlled.

Adjustment

ADJUSTING GATE OPENING

To adjust one of the measuring gates, turn the adjusting nuts to raise or lower the gate. A circular indicator on the screw gives a reading on the scale which corresponds to the opening between the bottom of the gate and the feeder plate (See Fig. 52A).

RECIPROCATING FEEDER

The reciprocating feeder (Fig. 52) will need periodic adjustment to take care of the wear resulting from the continual sliding back and forth. Along the sides, shims can be placed to take care of this wear; while at the back, a slotted adjusting plate is provided for the same purpose.

To change the stroke of the feeder, remove the pin which connects the connecting rod to the crank and reinsert in the desired hole. The hole farthest off center produces the longer or six inch stroke.

NOTE: During operation it is good practice to check the speed of the feeder occasionally, since this will affect the feeding. This is easily done by counting the strokes of the feeder which should be about 49 a minute.

Adjust the throttle setting on the engine to obtain the correct speed.

Drum, Trunnion Tires and Rollers

Function and Operation

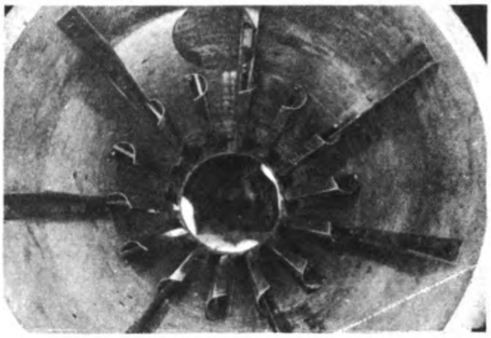


FIGURE 54

Interior of drum showing curved plates and lifting flights.

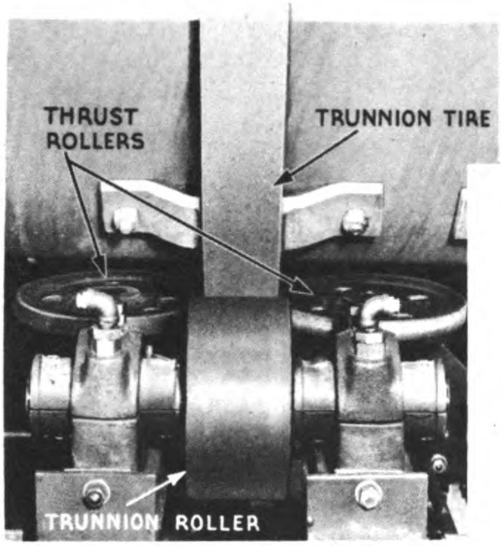


FIGURE 53

Detail of drum support showing thrust rollers, trunnion tire, and trunnion roller.

FIGURE 55

Thermometer for indicating temperature of aggregate as it leaves the Dryer. Thermometer reads to 550°.

THE DRYER DRUM is a large, rotating cylindrical shell of special heat-resistant steel, ten feet long and three feet in diameter, in which the aggregate is heated and dried as it passes through.

Inside the drum, (Fig. 54) curved plates and angles, known as LIFTING FLIGHTS, are bolted longitudinally. The flights pick up the aggregate from the bottom of the drum and drop it through the hot gases as the drum revolves. The hot gases pass through the drum in the opposite direction to the flow of aggregate. The dried aggregate is discharged from the drum through a discharge chute. This chute has an extension which directs the flow of material onto the Mixer conveyor. The extension can be reversed to direct the material at right angles to the drum for discharge on either side. The extension also holds the recording bulb from the dial type aggregate thermometer. This thermometer (Fig. 55) must be checked for accuracy before operation.

The drum (Fig. 53) is driven by a heavy chain which drives a large sprocket bolted around the outside of the drum. This chain is kept taut at all times by a spring idler which may be adjusted to keep proper tension.

The drum is supported by two circular steel tires known as TRUNNION TIRES which are bolted around the outside of the drum, one near each end of the drum. These tires ride on small rollers, known as trunnion ROLLERS. The rollers are four in number, one under each side of the drum for both tires.

The drum is supported by the rollers at an angle of six degrees downhill from the stack or charging end when the main frame is level. This slope is necessary so that as the drum revolves the material will gradually pass through it to the lower or discharge end. The 6° slope has been found to be the most satisfactory; therefore, the drum is mounted at that angle to the main frame so that all the operator has to do is to level the main frame.

Since the drum is mounted on a slight slope, it will have a natural tendency to move downhill or toward the discharge end as it revolves. To maintain the drum in a stationary position, the trunnion rollers are set at a slight angle to the trunnion tires to neutralize this tendency. The correct position is maintained by two small THRUST ROLLERS mounted on either side of the discharge end trunnion tire. If the drum should start to shift either way, they will act as emergency supports until the trunnion rollers can be adjusted.

It is highly important to check the thrust rollers from time to time to see that the drum is operating properly. If the tire is riding only intermittently against either thrust roller the drum position is correct but if the trunnion tire should start to ride hard against one thrust roller, possibly causing the bearing to overheat, it is an indication of improper adjustment of the TRUNNION rollers and the drum should be shut down for their adjustment.

Adjustment

ADJUSTING TRUNNION ROLLERS

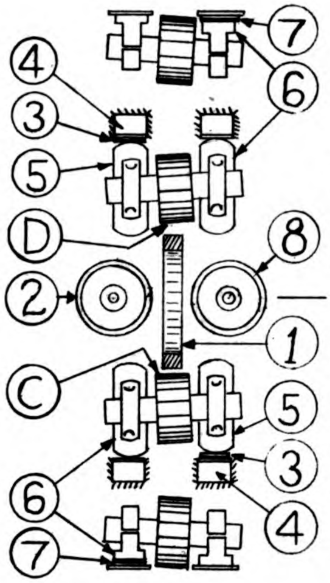
To adjust the trunnion rollers, it is usually necessary to skew only the trunnions at the burner end of the drum. These rear trunnion assemblies are skewed approximately 3/16" at the factory. When the Dryer has been started and material is flowing through, observe the thrust rollers. If the rear trunnion tire is riding hard against the lower thrust roller, both trunnion rollers should be skewed more by inserting shims between angle clip and bearing, inserting the same amount on both sides to keep the shafts parallel. See instructions with (Figs. 56 and 57).

If the tire is riding against the upper thrust roller, the trunnions should have some of the skew removed by taking out shims.

Whenever a trunnion assembly is skewed, the bearing surface at the point of contact of the drum tire and trunnion roller is altered. This causes only the edge of the tire to be in contact with the rollers. To remedy this condition, it is necessary to shim up the bearings which have not been moved inward to again obtain full bearing surface between the drum tire and trunnion roller.

GREASING TRUNNION BEARINGS

When greasing trunnion bearings be careful not to allow any grease or oil to get on the trunnion rollers or tires; otherwise, they will slip instead of turning and wear flat in spots. If grease should get on the roller and it should start to slip, throw a little sand on the surface to start it turning. After the drum has been used for a time, it is good practice to examine it and tighten all the nuts, since the heat causes the drum to expand and contract.



If drum tire (1) is riding hard against thrust roller (2), skew rear trunnions (C and D) by inserting shims (3) between angle clip (4) and bearing (5). After skewing bearing (5) inward, insert shims (7) under bearing (6), until drum tire again rides flat on the trunnion roller. If drum tire (1) rides hard against thrust roller (8), reverse the above procedure. The upper trunnions are not skewed unless after skewing rear trunnions (C and D) the drum still rides downhill. In such a case, skew trunnions (E and F) enough to cause drum tire (1) to ride evenly between thrust rollers (8 and 2).

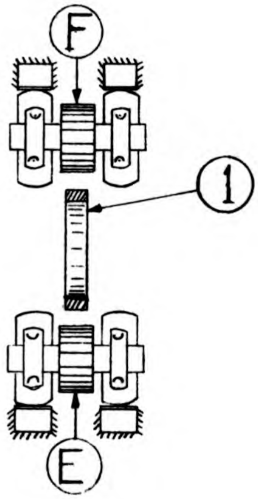


FIGURE 56

FIGURE 57

The speed of the drum should be 15 revolutions per minute. Since the operating speed of the machine is constant, this is a good way of checking whether the engine is operating at correct speed of 1400 RPM. To correct, adjust the throttle setting.

TO ADJUST THERMOMETER

When the Dryer is operating and hot material is passing through, it is advisable to adjust the dial type aggregate thermometer. Remove one of the screws from the plate marked "Remove to Adjust". Rotate the plate downward to expose the adjusting screw.

Then take a sample of the aggregate from the discharge chute and record its temperature with an accurate pocket thermometer. Check this reading with that of the dial thermometer and if the dial thermometer needs adjusting, turn the adjusting screw which will turn the pointer to the correct reading. Check again and if correct, replace plate and screw.

FIGURE 58

Back of Aggregate Thermometer

Combustion Chamber and Cone

Function and Operation

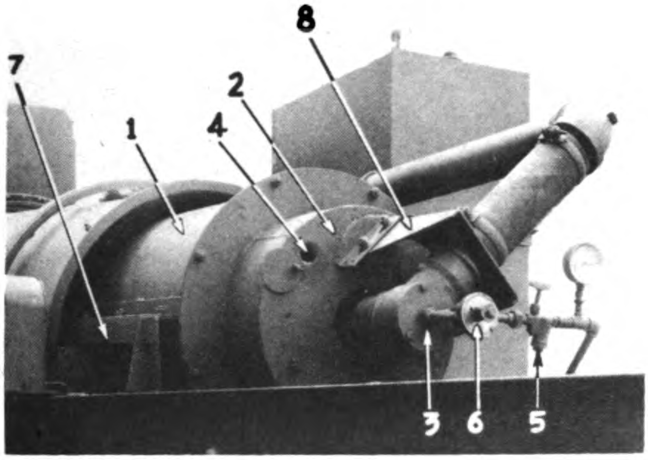


FIGURE 59

Hauck Burner and Controls

THE COMBUSTION CHAMBER (1) (Fig. 59) consists of a refractory-lined steel cylinder mounted at the discharge end of the drum. The COMBUSTION CONE (2) is a smaller steel cylinder, likewise lined with refractory, which is tapered to conform to the shape of the flame. The function of the cone and combustion chamber is to obtain proper burning of the fuel. After a few minutes of operation, the refractory lining in the chamber becomes very hot, causing the spray from the burner (3) to be converted into a gas which burns instantly.

The cone has four small port holes (4) spaced around the large opening for the burner. These ports admit secondary air as required for combustion; for a larger flame, more air is required. Steel flaps on these holes are provided for shutting off this air if desired.

Adjustment

Little maintenance work is required for the cone and combustion chamber. The only maintenance would occur if the refractory should be broken and fall out from a blow of some sort. If this occurs, the cone or chamber will have to be taken off and relined with castable refractory and firebrick. This is explained in the Maintenance Section.

Burner

Function and Operation

The Hauck low pressure type BURNER (3), (Fig. 59) atomizes the oil and air into a spray which forms the flame for drying the aggregate.

The burner is fastened to the combustion cone, with the distance between the nozzle and the edge of the cone being about one inch.

The oil is pumped into the burner under about thirty-five pounds pressure, passed through a long tube, and out four small holes on the end. The air is pumped into the burner at only two pounds pressure but about four hundred cubic feet per minute. It surrounds the holes from which the oil is emitted, so that an oil air atomized spray leaves the nozzle.

The amount of oil used is controlled by a MICRO-REGULATING VALVE which gives fine adjustment for easy control of the flame. A STRAINER NEEDLE VALVE (5) is also used for straining out impurities which might clog the nozzle or micro-valve and for cutting off the flow to relieve pressure on the micro-valve. When operating, the strainer valve is always wide open, adjustments being made by the calibrated micro-valve.

The amount of air used is controlled by a BUTTERFLY AIR VALVE which is regulated proportionally with the micro-valve to obtain proper combustion. This valve should always be open whenever the oil valve is open. The amount of secondary air is controlled by the secondary air nozzle on the burner and by the ports in the cone. As the size of the flame increases, more secondary air is required so the nozzle is turned and the ports are opened to admit more air.

Fuel Oils

The burner will operate effeciently with several grades of fuel oils. The consumption of fuel oil will vary from 1-1/2 to 3-1/2 gallons per ton of aggregate dried, depending primarily on the amount of moisture to be removed from the aggregate, the amount of aggregate temperature raise and the BTU content of the fuel oil used.

For this application we recommend the use of a No. 4 fuel oil having the following specifications:

A. P. I. Gravity at 60°F. - 12 to 20

Flash Point not under - 150 to 250°F.

Sulphur not over - 1.5%

Water and Sediment not over -.1 o/o

Pour Point - .0°F.

BTU Content per gallon - 145,000

Saybolt Universal Viscosity not over - 90 to 125

Note: Heavier oils than the above may be used if pre-heated. When using a heavy pre-heated oil care must be exercised to avoid vaporization as it will cause burner pulsations with resultant varying flame intensity.

When diesel fuel oils only are available they may be used in place of above recommended fuel oils of higher BTU content. The lower BTU content of diesel oil will result in higher gallon consumption per ton of aggregate dried. In general, diesel oils fall within the following specifications:

A. P. I. Gravity at 60°F. - 34 to 38

Flash Point not under - 150°F.

Sulphur not over - 1 °/o

Water and Sediment not over - 0.5 °/o

Pour Point - 0°F.

BTU Content per gallon - 120,000 to
135,000

Saybolt Universal Viscosity - Approximately 35

LIGHTING THE BURNER

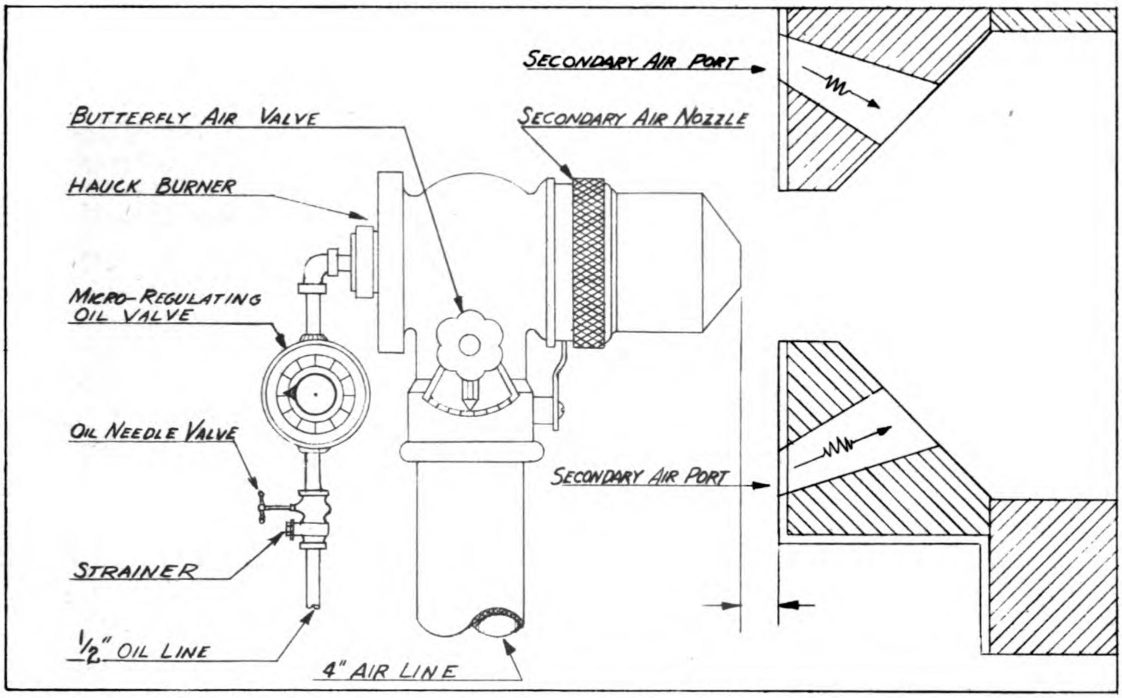


FIGURE 60

1. NEVER operate the burner unless the drum is rotating.

2. Close the oil valves, butterfly air valve, and pressure gauge, turn the secondary air nozzle all the way to the left (closed) (See Fig. 60) and open the stack damper.

3. Start the blower and oil pump, check the oil pressure and note that the air relief valve is functioning properly.

4. Fashion a torch (a ball or wad of cloth or waste wrapped around the end of a stiff wire) and soak it in a small container of fuel oil which should be kept handy for this purpose.

5. Light the torch and hold it just below and in front of the nozzle of the burner. Open the butterfly air valve one fourth to half way, then open the oil needle valve wide and then SLOWLY open the micro-valve until the burner lights. Be careful of the flame puffing back through the secondary air ports in the cone.

6. Try to get a steady flame and then adjust it to enter into the drum about three feet. To do this, open the micro-valve a little, then the butterfly air valve, repeating until the desired size is reached. It is necessary to obtain proper balance between the oil and air to obtain proper combustion. As soon as flame is functioning properly, remove the torch and put it out, but keep it handy in case the flame should go out.

   NOTE: The Secondary Air Nozzle is an extra air control for changing the character and intensity of flame, and should be used. For hotter flame turn it to the right, and for softer flame to the left. It is usually regulated in proportion to the other valves and according to kind of flame desired.

7. The flame should be vigorous and yellowish in color; it should not be dark or red and lazy in character, which is an indication of too much oil or too little air. If it puffs or sputters, add more oil and increase the draft with the damper in the stack. If the exhaust from the stack is black and smoky, cut down the oil. Do not open the damper too wide, for it is just a waste of heat, besides blowing the fine aggregate out the stack.

8. If the burner should happen to extinguish, shut the micro-oil-valve immediately. Leave the air on to clear the chamber of oil vapors before trying to relight. Always relight with the torch, never try to light from the hot firebrick.

Adjustment

STRAINER OIL VALVE

The strainer oil valve (Fig. 60) should be cleaned out before operation by removing the plug and washing the screen. Be careful not to let any impurities pass through when doing this.

BURNER OIL NOZZLE

Sometimes the burner oil nozzle will clog which requires disconnecting the oil line at the union and unscrewing the plug in the end of the burner which allows the oil nozzle tube to be pulled out. This tube then unscrews and comes apart so that it can be easily cleaned out.

Blower and Oil Pump

Function and Operation

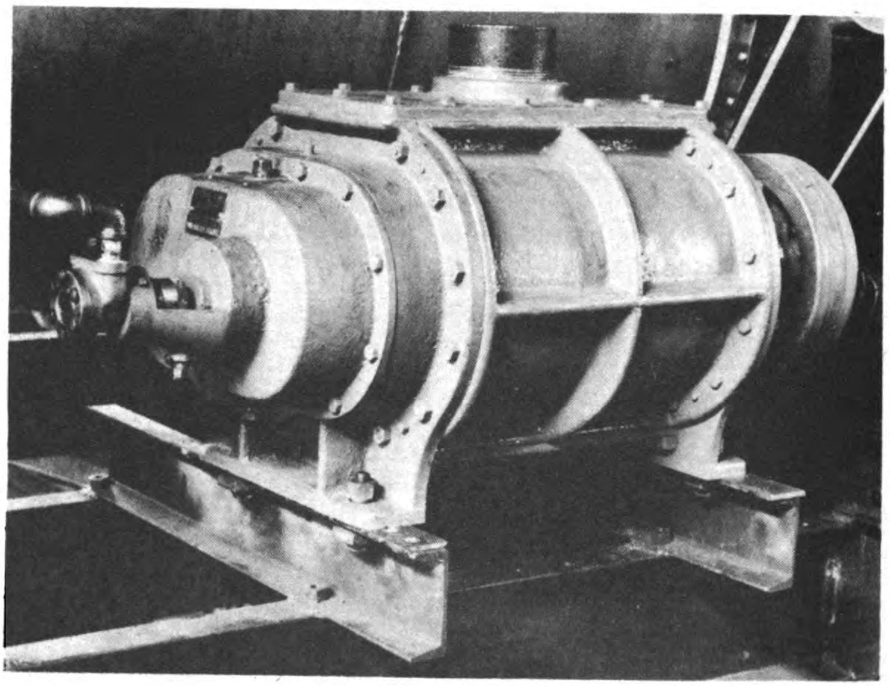
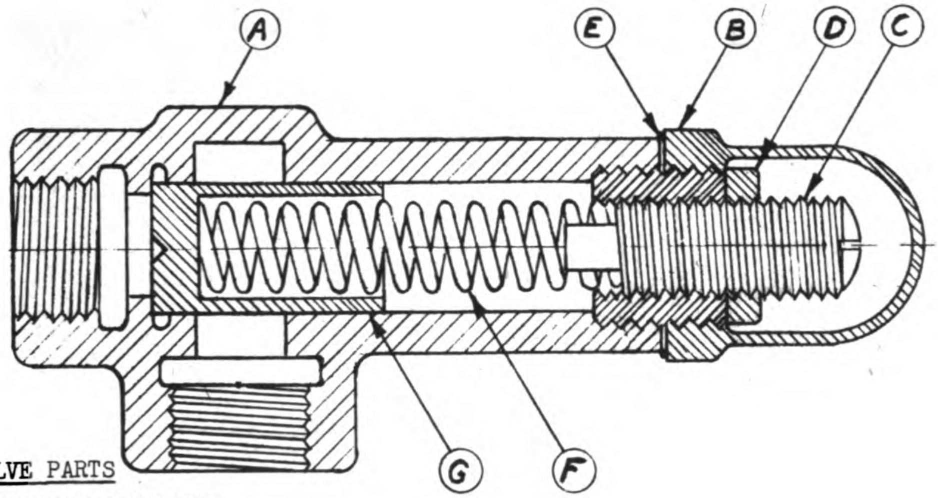


FIGURE 61

Victor-Acme Blower with Viking Fuel Pump Mounted on End



RELIEF VALVE PARTS

(A) - RELIEF VALVE HOUSING
(B) - " " CAP
(C) - " " PRESSURE ADJUSTING SCREW
(D) - " " " " " LOCK NUT
(E) - " " GASKET
(F) - " " PISTON SPRING
(G) - " " PISTON

FIGURE 62

Oil relief valve for controlling pressure of the oil to the burner.

The BLOWER (Fig. 61) is a Victor-Acme positive displacement type which furnishes a steady flow of air to the burner.

The OIL PUMP is a Viking rotary gear positive displacement type and is mounted on the end of the blower. It pumps the oil from the storage tank to the burner.

OIL RELIEF VALVE

The RELIEF VALVE (Fig. 62) in the OIL line is used to control the pressure of the oil to the burner. When the burner is operating, the valve is adjusted to deliver oil at thirty-five pounds pressure as shown by the gauge.

AIR RELIEF VALVE AND WEIGHTS

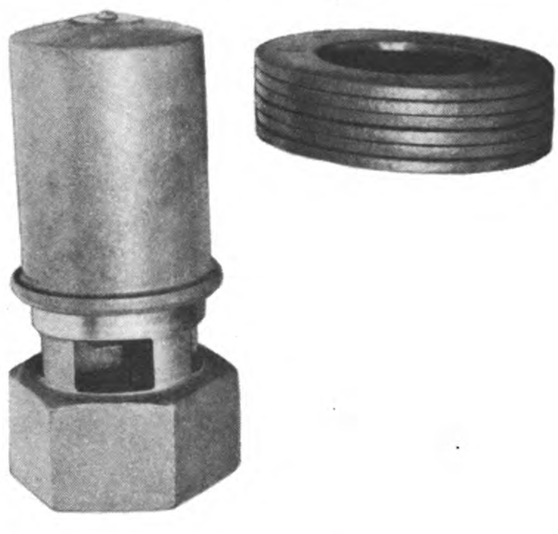


FIGURE 63

Air Relief Valve and Weights

The RELIEF VALVE in the AIR line is a weighted type valve and is used to maintain constant air pressure. The six weights maintain the air at two pounds pressure.

Adjustment

To adjust the oil pressure (See Fig. 63) remove the cap from the valve. Then loosen lock nut and turn adjusting screw to the right to increase pressure or to the left to reduce pressure. Tighten nut and replace cap.

Be careful not to lose any of the weights from the air relief valve. It is necessary to use six weights in order to get air at two pounds pressure.

Exhauster Fan and Stack

Function and Operation

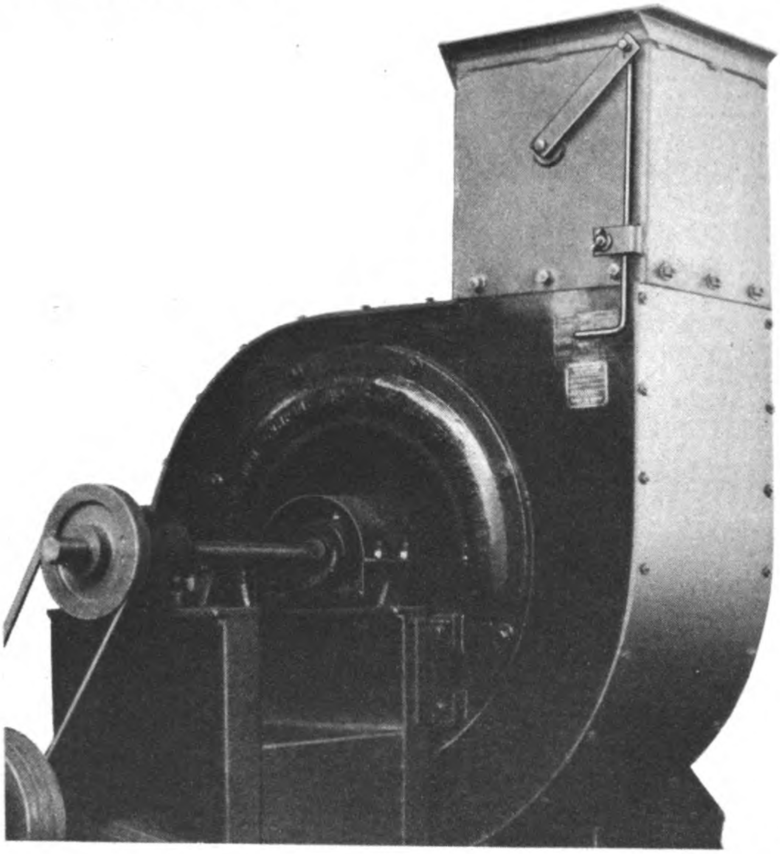


FIGURE 64

Exhauster Fan and Damper

The EXHAUSTER FAN (Fig. 64) is located under the stack at the charging end of the drum. It is a Clarage flat bladed fan and its purpose is to draw the air, flame and hot gases out of the drum and blow them out through the stack. The fan is necessary since the low pressure burner flame would be choked off by the aggregate if sufficient draft was not provided by this fan.

Since the fan operates at constant speed, the amount of draft is controlled by a DAMPER in the stack. This damper should normally be about three-quarters of the way open but can be easily adjusted by a lever in order to get a steady flame.

Note: Do not operate the fan with damper wide open giving excessive draft for it is just a waste of heat and the fine material will be blown out the stack.

The fan is driven by a single V belt, and since it is driven at high speed it is important to start the fan operating with the engine at low speed and then increase the speed with the engine throttle. This is necessary in order not to damage or break the single V belt. Slack in this belt is taken up by a spring idler which should not bear tightly against the belt to prevent its being scratched and damaged.

The stack is hinged so that the upper portion may be lowered for travel. It fastens to an angle support on the fuel tank.

Adjustment

The fan operates at high speed under high temperature; therefore, it should be watched for repairs, especially the bearings. The inner bearing is air cooled to overcome the high temperature but proper lubrication is quite important.

Fuel Tank

Function and Operation

A two-hundred gallon FUEL OIL TANK is mounted on the frame by the blower. A supply line from the bottom of the tank furnishes oil to the pump. This supply line contains a gate valve for cutting off the supply to the pump and a strainer to keep foreign material out of the system. It is important to keep the fuel free from impurities at all times.

An overflow line from the relief valve enters the tank about half way up. This line is needed so that the pump can operate at a constant high capacity but the pressure in the line to the burner always remains at thirty-five pounds even when the burner is completely shut off.

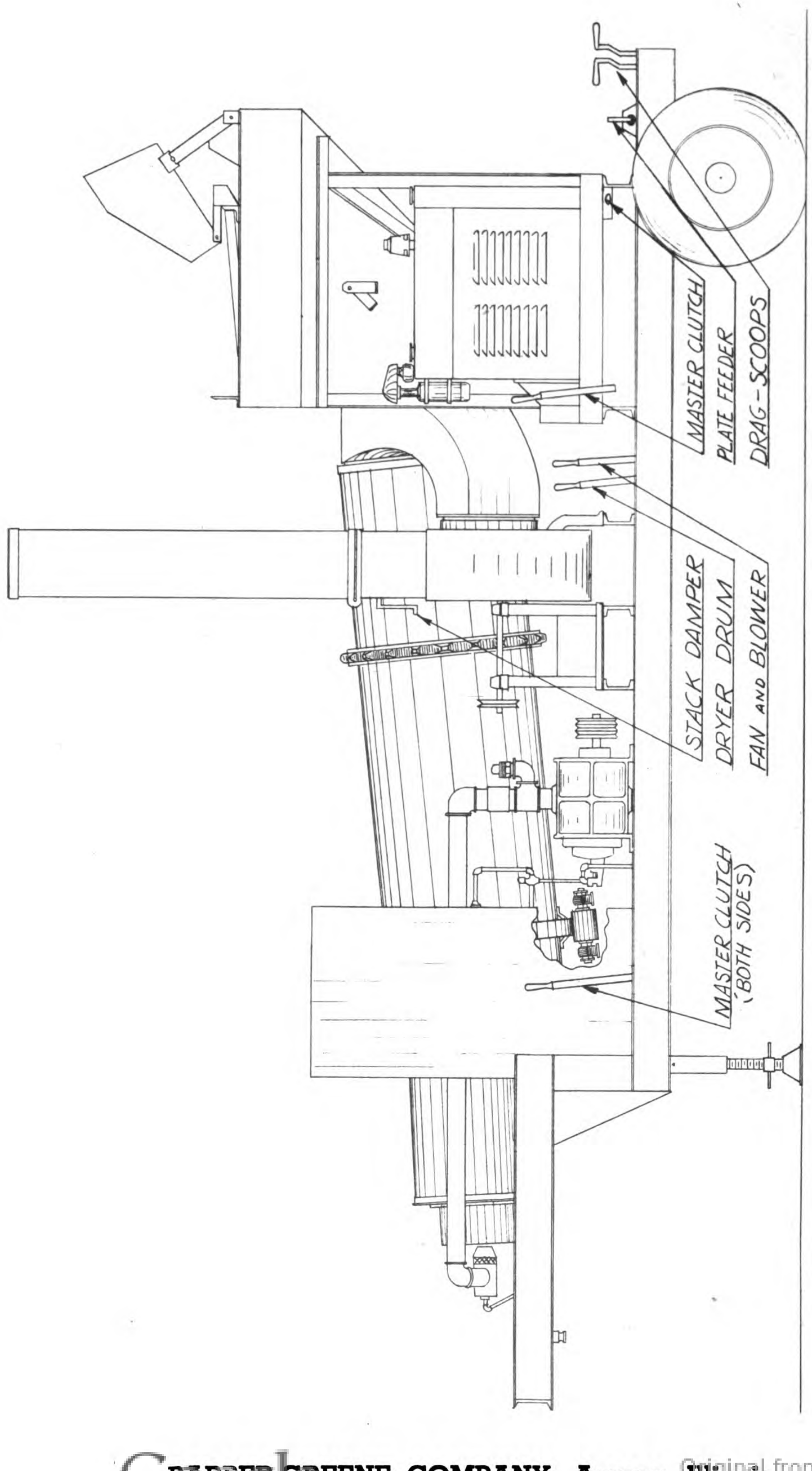
Adjustment

Sediment will build up in the tee because of the strainer screen and should be cleaned out by removing the pipe plug. If it is necessary to wash the screen, disconnect the pipe at the union to get the strainer screen out. Keep the fuel tank absolutely clean and be careful when filling not to get dirt in with the fuel oil.

Operating Levers (See Fig. 65)

1. Master Clutch Lever

All the machinery on the 831 Dryer and Elevator is controlled by the master clutch lever (or one of its remote controls) which operates a friction clutch located in the speed reducer housing on the engine. Cables and extensions allow the clutch to be operated from four spots around the machine (see drawing): at the clutch housing; in front of the engine; and on either side of the machine at the discharge of the Dryer drum. This is a friction clutch because it is necessary to start all machinery in operation slowly to prevent strain or damage; therefore always ease this clutch in slowly. This master lever should always be used to stop the Dryer before engaging the drum or elevator, since these units are controlled by jaw clutches.



831 DRYER OPERATING LEVERS

FIGURE 65

2. ENGINE THROTTLE LEVER

The speed of the engine and all operating machinery is controlled by the throttle lever. This lever has two positions marked by notches in the support bracket: one for idling and one for operating speed. Operating speed is about 1400 RPM at full load. Correct speed at full load can be checked by counting the strokes of the plate feeder which should be approximately 49 a minute.

3. DRUM CONTROL LEVER

The Dryer Drum is controlled by the drum control lever which operates a jaw clutch on the main jack shaft. This lever should not be engaged until machinery has been stopped with the master clutch to prevent damage to the drive when the drum starts rotating.

CAUTION: This lever must always be engaged (i.e., the drum MUST be rotating) whenever the burner is being used.

4. FAN AND BLOWER LEVER

The exhuaster fan, blower and oil pump are controlled by the fan and blower lever which operates a jaw clutch located on the blower jack shaft. The master clutch should be disengaged before throwing in this jaw clutch in order to prevent possible damage to the clutch jaws.

5. RECIPROCATING FEEDER LEVER

The reciprocating feeder under the aggregate hopper is controlled by the feeder control lever which operates a jaw clutch located on the feeder crank shaft. Since the jaws are undercut, it may be necessary to disengage the master clutch before it can be thrown out. Whenever possible, the master clutch should be used for starting it, also, to prevent damaging the clutch jaws.

6. DRAGLINE SCOOP LEVERS

The two dragline scoops are controlled separately by two control levers which operate friction clutches, drums, and brakes on their respective shafts.

They may be engaged at any time; however, only ONE scoop lever can be engaged at a time to prevent the engine from being overloaded.

7. ELEVATOR LEVER

The bucket elevator is controlled by the Elevator control lever which operates a jaw clutch on the Elevator counter shaft. See "Clutch Lever", Fig. 67.

Before engaging the jaw clutch, it is advisable to stop machinery with a friction clutch to prevent damaging clutch jaws since the Elevator will have quite a drag on the engine.

8. ELEVATOR HAND HOIST WHEEL

The bucket Elevator is raised into position by a hand wheel which operates a single cable hoist. By connecting the hoist cable hook to a bracket on the hopper, the Elevator is raised easily up into position simply by turning the wheel.

9. EMERGENCY BRAKE LEVER

The brakes are controlled by a ratchet type lever located in front of the wheels on the right or off-road side.

Operating Personnel

The operation of the 831 Dryer on bituminous mixing with the 841 Dragline Mixer will require a Dryer Operator, Operator, Greaser, and four Laborers. This crew of seven will be responsible to the Plant Superintendent for the efficient functioning of the Dryer. Qualifications and duties are briefly summarized as follows:

1. Dryer Operators

This man should be experienced in the mechanical operation of heavy machinery and thoroughly familiar with the function, operation, and adjustment of all working parts of the Dryer and the coordination of their functions. This operator should be capable of directing the other men working with the Dryer in the execution of their duties. He will control the mechanical operation of the Dryer.

2. Dragline Operator

This man should have some mechanical experience and will operate the dragline controls for the Scoops which supply aggregate to the 831 Elevator.

3. Greaser

This man should have some mechanical experience and a knowledge of the functional parts of the machine, their lubrication, and be capable of making mechanical adjustments as directed by the Dryer Operator.

4. Laborers (four required)

Two laborers are needed to handle the Scoops on the dragline. Two laborers, with shovels, are needed to see that aggregate is properly fed to the 831 Elevator.

Machine Operation

The Bituminous plant is set up as described under the section entitled "Plant Set-up". Before actual mixing can begin, however, some preliminary work is necessary. Before operation, the DRYER should be thoroughly lubricated and the engine serviced according to instructions. While this is being done, supplies should be brought in. The aggregate gates in the hopper should be set to the correct openings according to the charts and information given in the section "Construction Information". The Mixer should also be receiving necessary preliminary attention.

NOTE: During the description of the operation of the Bituminous plant, the operation of the Dryer will be described in detail, but Mixer operations will be only referred to since they are described in detail under "841 Mixer Machine Operation".

The first step is to start the Dryer engine. Allow it to warm up. Advance the throttle to operating position and operate each unit on the machine independently to check such items as clutch adjustments, proper oil and air pressure, and proper chain slack. When everything is operating satisfactorily, operation of the plant can begin.

Fill the Dryer hopper with material, using the bucket elevator and drag scoops. To do this, disengage the plate feeder, throw in the elevator, then start with the master clutch so the elevator will not buck or jerk. Be careful not to shovel material in too close to the buckets or the elevator will be choked. The drag scoops are operated at the same time to pull in material close to the shovel men. As soon as the hoppers are filled sufficiently, disengage the master clutch. See also 841 Mixer Machine Operation.

When ready to operate the whole plant, engage the drum clutch and the fan and blower clutch on the Dryer. Then throw in the master clutch, which will start everything on the Dryer operating except the feeder.

Light the burner and allow it to heat the drum, adjusting the flame to enter the drum about three feet. When the drum is heated and the burner is functioning properly, throw in the plate feeder clutch which will start feeding aggregate into the drum. Resume feeding the buckets, maintaining an even level in the hoppers.

When the burner lights, the Mixer operator starts operating the conveyor and pugmill. When the material starts to fall onto the conveyor he throws in the Kinney pump clutch, having the spraybar valve set to circulate. As soon as material flows into the pugmill, he turns this valve open to spray position and the mixing begins.

The Scoop Dragline Operator on the ground who controls the feeding must keep aggregate in the hopper above the level of the gates, otherwise uneven feeding would result which would give improper proportioning and an unsatisfactory mix.

Therefore, if there should be a lag in the feeding of the elevator which requires stopping, he should signal to the Dryer Operator to turn out the burner, and then he should stop the drum and feeder so the hopper can be filled, and then resume operation as before.

Since the Scoop Dragline Operator is on the ground, he cannot see the level of the aggregate in the bins. Therefore, he must watch the telltales on the Dryer hopper which will swing down when the bins are too empty. Occasionally, someone must clean off the grizzly screen on top of the hopper and he should look to see that the telltales are working properly.

The Dryer Operator is responsible for the operation of the burner. This is an important job and the success of the mix depends in great part upon his operations.

When the aggregate is mixed with asphalt, the aggregate must be dry in order that the bitumen will adhere to the stone. Since natural aggregate normally contains moisture, the drying process is required. The larger the size of the aggregate, the easier it is to dry since smaller aggregate has more surface area, pound for pound. However, it is not necessary always to have the aggregate bone-dry; a very small amount of moisture will not hinder the mixing.

It is understood, of course, that the amount of moisture present in the natural aggregate varies quite a bit, depending upon the weather. If the aggregate has just been rained on, it will be very wet and the drying, capacity will be materially lessened. However, if the aggregate should be turned or aerated and the sun allowed to shine on it, the excess moisture will soon be lost.

This Dryer Operator should first note the condition of the natural aggregate to judge approximately how difficult the drying will be. Then, when the material starts passing through the drum, he must judge from the temperature and the appearance of the dried aggregate whether the drying is satisfactory. The aggregate should not be overheated, but it should be dried sufficiently so it will mix properly. Average drying requires temperatures usually of about 200° F., very moist aggregate requiring 250° or even higher. Dust will usually arise at the discharge end if drying performance is good.

The temperature range of the dryed aggregates is very important for mixes using RC's and MC's. Here the fire hazard dictates that this tem-

perature should be 200° or below in order to prevent a fire starting in the pugmill where the hot aggregates come in contact with these asphalts. In order to obtain low discharge temperatures, it requires careful adjustment of the burner as the moisture content remaining in the aggregate increases rapidly as this temperature drops below 212°. If the moisture content of the wet aggregate is such that a low temperature exists with a wide open burner flame and too much moisture remains, it will be necessary to lower the dryer aggregate gates in order to regain control with the burner at a reduced capacity.

With RC's and MC's, aside from the fire danger, it is desirable to keep the aggregate temperature down in order to obtain a suitable coating of asphalt. If too hot, the already thinned asphalt will bleed or run off the aggregate leaving a too thin coating.

It is important to know, especially when drying very moist aggregate, that all the drying is not done in the drum; for if the aggregate is very wet the material may not be in the drum long enough for all the moisture to be carried away, but if it is heated sufficiently so that it looks steamy as it discharges, the moisture will evaporate rapidly as it is aerated on the transfer belt conveyor. This aeration of the aggregate on the belt is quite important and its valve should not be overlooked when increased dryer capacity is desired.

Another way of checking for proper drying is to catch an occasional shovel full as it discharges and examine it. If there are dark, moist spots, or if material is holding together, it is still wet. Dried aggregate will be lighter color and the particles will be loose and flow freely from the discharge spout without sticking or clogging up.

Considering this, the Dryer Operator must adjust his flame from time to time according to the condition of the aggregate. Also, he should note the color of the exhaust smoke, for proper combustion will result in a light greyish smoke. If the draft is insufficient, the flame will choke and puff; if draft is too great the small, fine aggregates will be blown out the stack and the damper should be adjusted. By watching the flame in the drum the operator can also tell if he is getting maximum drying. A good flame will be vigorous and light yellowish in color, whereas a poor flame will be reddish or bluish and will seem lazy in character. The fuel used will, of course, affect the flame; medium-heavy oils will burn better than light diesel fuel oils.

If the machines are mixing material for repair jobs, it may be necessary to start and stop after every few truck loads. Operating at ths usual capacity of about twenty-five tons of mixed material per hour, it requires about twelve minutes of operation to fill a four cubic yard truck. The best policy is to make as few shut-downs as possible by using all trucks available, for continuous running is simpler and easier, and results in more accurate proportioning of the mix.

To shut down the plant for a short interval, the Mixer operator signals to the Dryer Operator to shut off the burner and then to stop the Dryer by throwing out the master clutch. It is necessary to cut off the burner first, otherwise when the clutch is thrown out the burner would extinguish anyway but oil would continue to flow out the nozzle for a short time from the pressure built up in the lines.

The Mixer is left operating long enough to empty the Conveyor belt of the hot aggregate to avoid burning belt. The cutoff gate is closed but there is enough storage capacity in the pugmill to take care of the small amount on the belt. The spraybar valve should be turned to circulating position as soon as the flow of aggregate decreases.

After the mixing job is completed, the plant is shut down but this time the hopper and drum are emptied as well as the conveyor. The pugmill is also emptied and cleaned out as much as possible. Then the machines are made ready for travel as described under the section "Plant Set-up".

831 PORTABLE BUCKET ELEVATOR

FIGURE 66

Principle and Application

The BUCKET ELEVATOR (Fig. 66) is a separate unit which can be towed behind the other machines. It is used to charge the aggregate hoppers on the 831 Dryer or the 821 Soil Preparation Unit, and is chain driven from these machines.

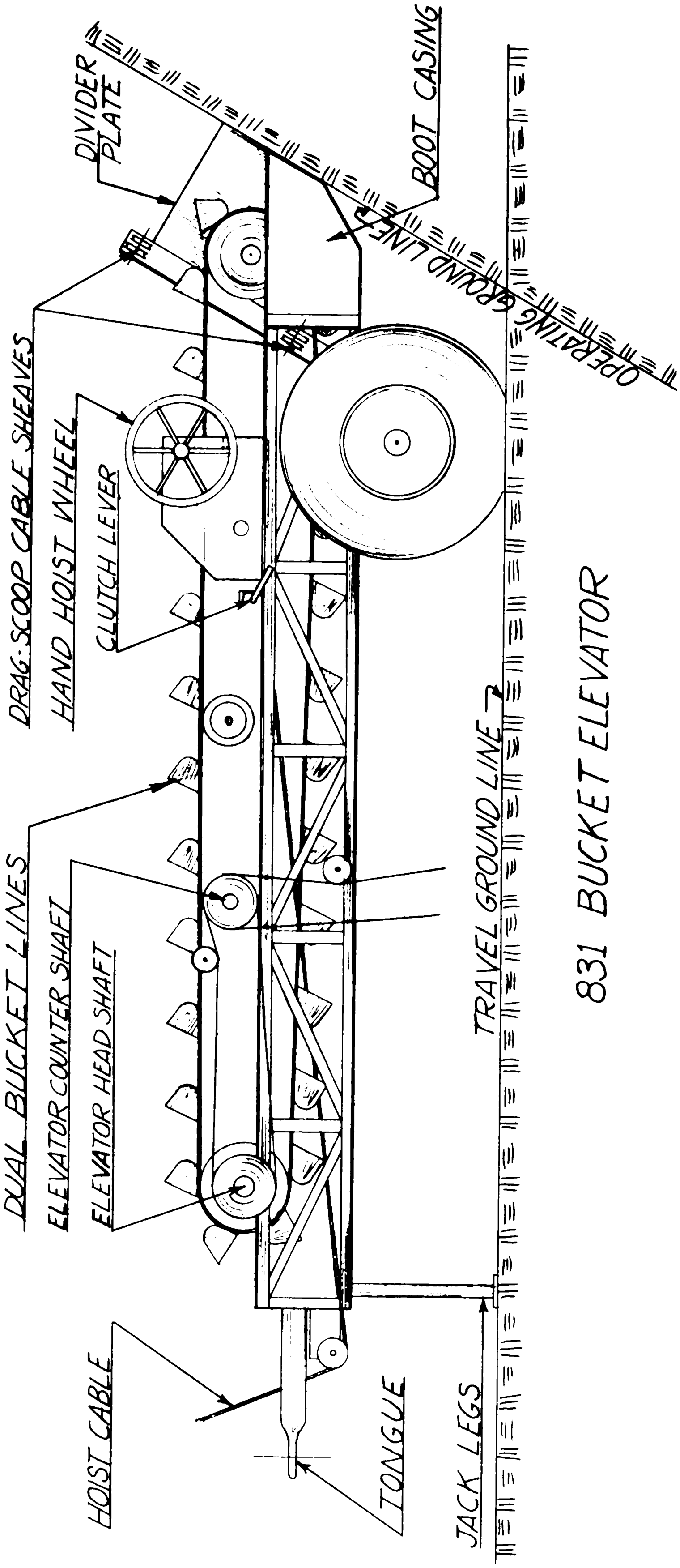
Essentially the elevator consists of twin lines of buckets which are driven from the head shaft and supported by roller idlers. The two bucket lines permit individual handling of two sizes of aggregate so the aggregate can be transferred from the stockpile to the divided hopper separately.

At the bottom or foot end of the elevator is a boot or casing which serves as a back for the buckets. A PLATE divides this boot and extends out beyond the buckets so the man shoveling into the buckets can easily keep the aggregates separate. This plate also supports one of the two SHEAVE ASSEMBLIES provided for the drag scoop cables.

The drag scoop cables should be threaded through the sheaves; however, if it should be necessary to pull the cables through the sheaves without removing the cable clamps, it will be necessary to remove the keeper from the sheave assembly. This can be done by removing the two bolts at each end of the sheave assemblies allowing the keepers to fall out. Then when the cables are placed around the sheaves, the keeper is replaced and bolted onto the top plate.

The elevator is raised into operating position by a CABLE HAND HOIST. (See Fig. 67). This cable passes under a sheave at the tongue end and locks on top of the hopper so that by winding up with the hoist, the elevator is raised into position. When operating, the wheels are off the ground and the elevator is resting on the boot. The position of the elevator is fixed by push arms attached to either the Dryer or Soil Unit.

A lever controls the operation of the elevator through a jaw clutch on the elevator counter shaft which is chain driven from either the Dryer or Soil Preparation Unit. Two drive chains are provided since two different lengths are required for the two different setups.



831 BUCKET ELEVATOR

FIGURE 67

The elevator has small JACKLEGS (Fig. 67) provided to support the front end when getting it ready for erecting. These jacklegs slide up out of the way for travel and when raising into place. Similarly, the TOWING TONGUE slides back so it will not be in the way.

Drag Scoops

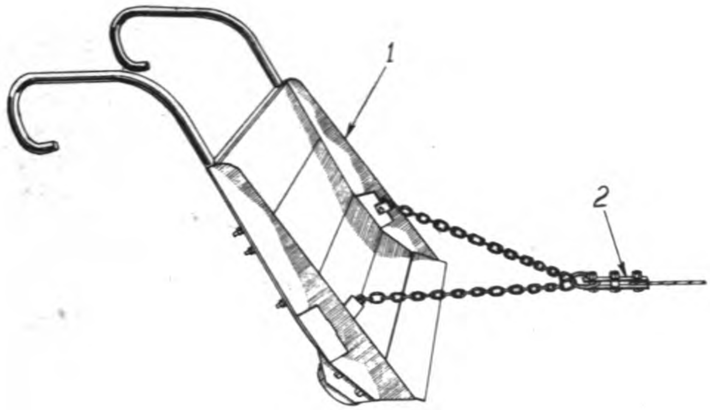


FIGURE 68
Bucket Elevator Drag Scoop

The DRAG SCOOPS (Fig. 68) are small wooden slips, easily handled by one man, which are used to pull material toward the buckets. These scoops are fastened to the cables and controlled by friction clutches and brakes on the 831 Dryer or 821 Soil Preparation Unit. One man operates the levers on the Dryer or Soil Unit for both scoops. Each lever has three positions: engaged, neutral and braked. Therefore, the operator engages the flutch to wind up the cable, pulling in the scoop; then throws it into neutral, allowing the scoop man to pull the scoop back for another load. The brake is necessary to keep the cables from snarling.

The scoops should not be pulled in too close to the buckets or they will choke and overload the elevator.

The scoops require a little practice to be able to handle them successfully. The operator should not get too much of a load or the scoop will flop over. Also, he will find that by easing down on the handles after getting a load, the scoop will slide easily up to the buckets. A lot depends on the operator controlling the levers for he can soon wear out the scoop man by improper braking or pulling.

Adjustment

When changing the elevator from the Bituminous setup to the Soil Plant setup, it is necessary to replace the drive chain by breaking the chain. This is easily done by removing the cotters from a link and driving the link apart. The slack in this chain is taken up by a weighted idler.

Excessive slack in the bucket line is taken up by adjusting the position of the head shaft through take-up screws which control its position. By turning the nuts on these screws the head shaft can be moved to get the proper slack in the lines.

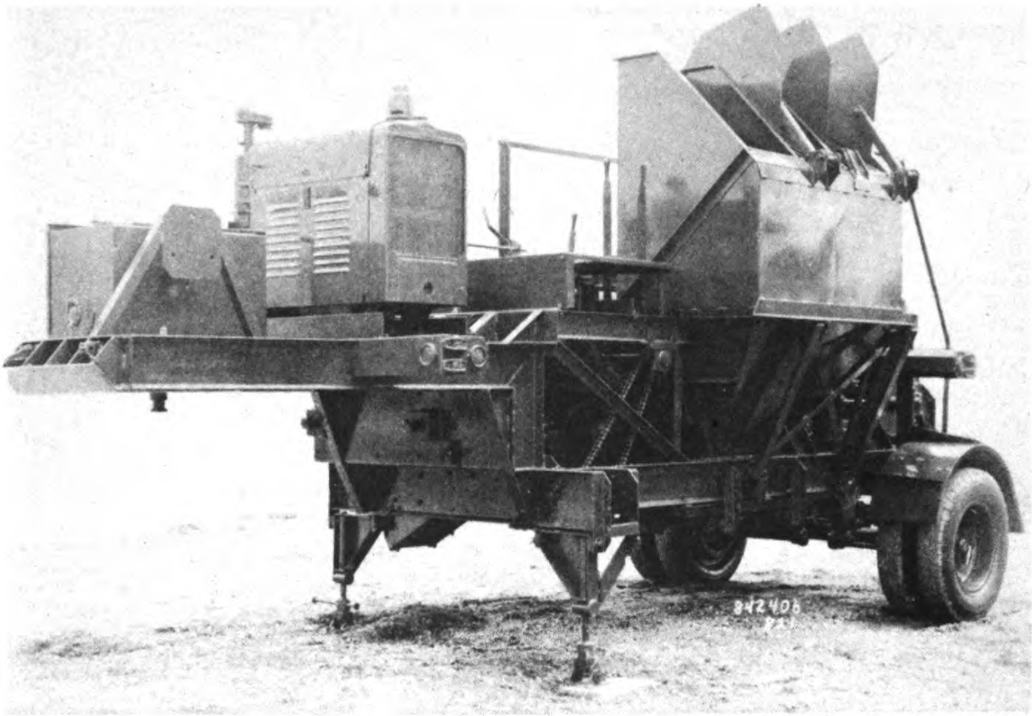


FIGURE 69

Aggregate hopper side of Model 821 Soils Preparation Unit.

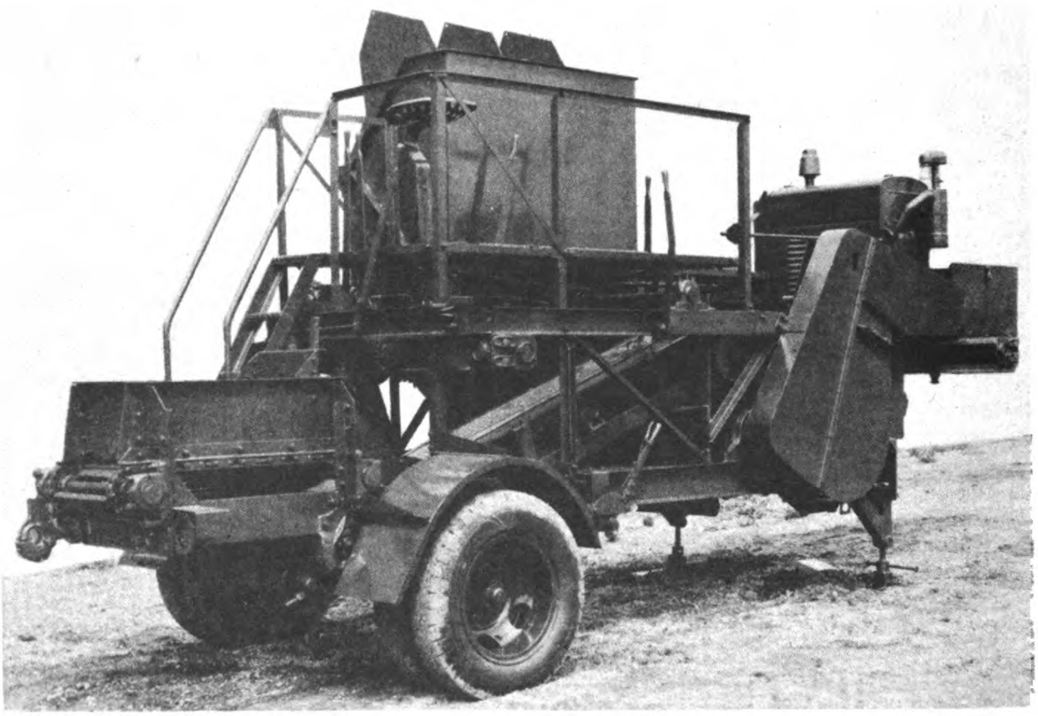


FIGURE 70

Controls side of Soils Unit showing soils hopper at left and conveyor to crusher rolls.

821 SOIL PREPARATION UNIT

Aggregate Hopper

Function and Operation

The AGGREGATE HOPPER (Fig. 72) is a divided steel bin with a capacity of three-quarters of a cubic yard of material in each half.

The purpose of this hopper is to provide sufficient storage capacity to take care of small variations which will normally take place in the feeding of the charging elevator, so that the level of the aggregate can be kept from falling below the top of the twin measuring gates.

On top of the hopper at the back side are fastened 3 hinged DISCHARGE PLATES which are used to direct the material as it is discharged from the bucket elevator into the bins. These plates swing down inside the hopper for traveling.

Over the two bins of the hopper are placed Grizzly Bar Screens which serve to keep out oversized material, roots, and other undesirable material, besides acting as guards. These grills rest on supports and can easily be removed if necessary. Also, on top of the hopper but at the front end is a small anchor bracket, used for raising the elevator into

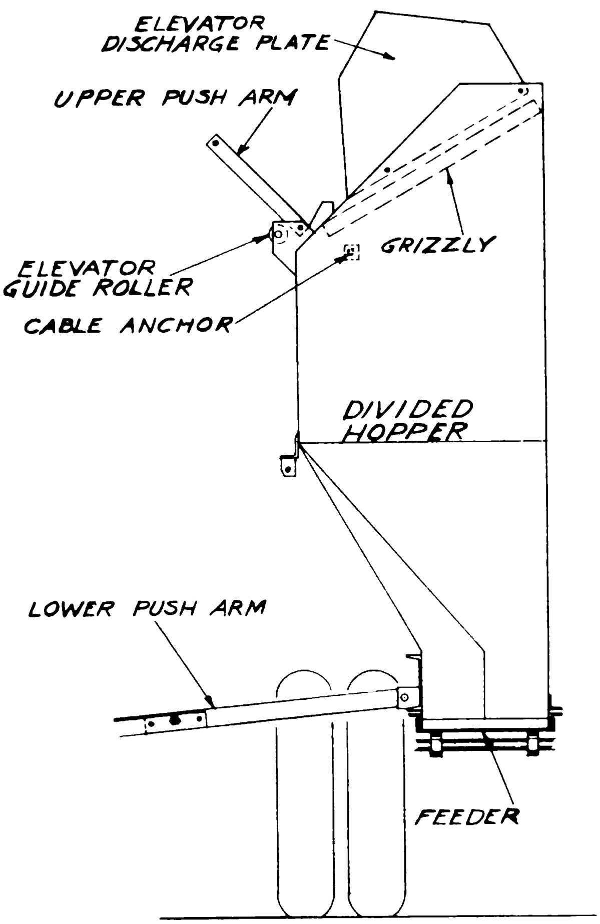
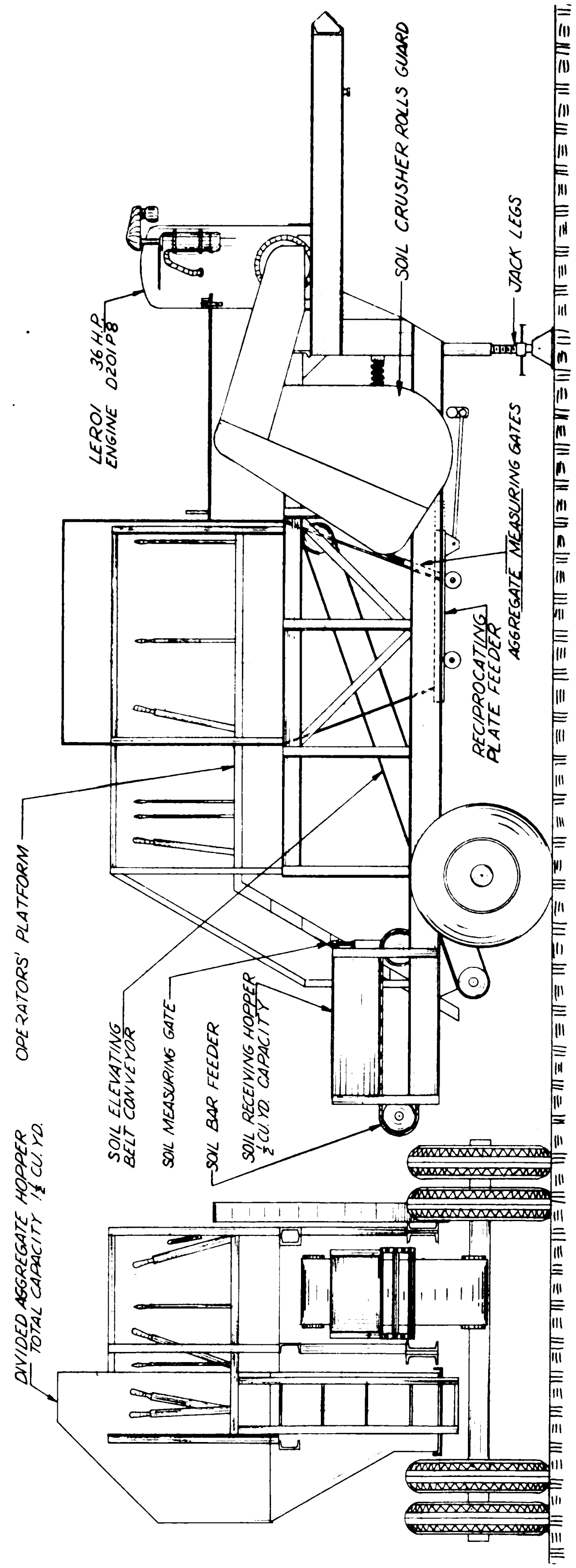


FIGURE 72

Aggregate hopper and details



821 SOIL PREPARATION UNIT

FIGURE 71

BARBER-GREENE COMPANY, Aurora, Illinois

position. The cable passes over this bracket and hooks into a hole in the plate which divides the bins. On the outside of the hopper at the top are fastened Guide Rollers on which the elevator frame slides when it is being raised.

On the front side of the hopper, near the top and bottom respectively, are found the UPPER and LOWER PUSH ARMS or braces used to hold the elevator in operating position. When not in use, the top arms swing back over the hopper, being supported by the grizzly bar screens. The lower push arm jackknifes and swings up against the hopper, being held in place in similar fashion.

When operating the machine, it is necessary to watch the level of the aggregate in the bin, not only to maintain the aggregate at the proper level but to check that the material does not arch in the bins, causing improper and reduced feeding. This is not a usual occurrence but is important since the proportions of the mix would be affected by its happening.

Adjustment

The hopper requires little attention in the matter of upkeep or adjustment, about the only thing necessary is to check the discharge chute and push arms periodically to see that they are secure.

After operations are finished, the hopper should be emptied and cleaned. Material left in the hopper would cause unnecessary traveling weight and might be difficult to clean out if it is rained on and settled.

Reciprocating Plate Feeder and Gates

Function and Operation

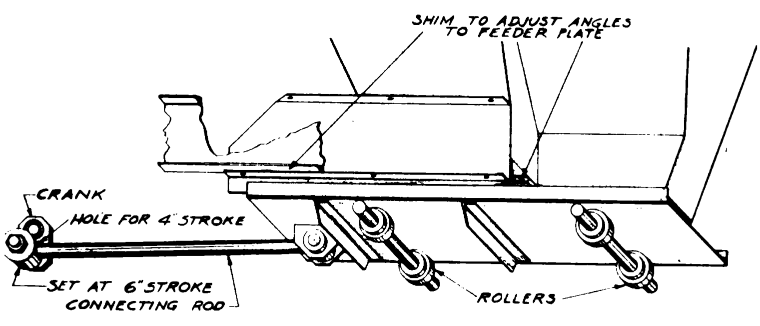


FIGURE 73
Reciprocating Plate Feeder

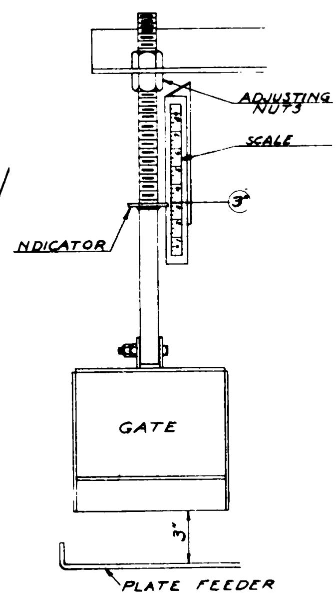


FIGURE 74
Measuring Gate

The RECIPROCATING PLATE FEEDER (Fig. 73) discharges measured quantities of aggregate from the divided hopper through the TWIN MEASURING GATES (Fig. 74) onto the 841 Mixer conveyor.

Essentially, the feeder is a steel plate which slides back and forth on SUPPORT ROLLERS at the bottom of the hopper. The twin gates are independently constructed, consisting of steel plates fastened to long, threaded adjusting screws so that they may be moved up or down over an opening in the hopper. In this way, the amount of material being fed out by the plate feeder can be controlled, and, since the gates can be independently adjusted, any desired amount of material may be fed out from either side.

The back and forth motion of the PLATE FEEDER is produced by a connecting rod attached to the feeder plate and eccentrically connected on the other end to the feeder crank shaft. Two lengths of strokes are possible, a four inch and a six inch, the latter being the usual connection. The connection which produces a four inch stroke becomes necessary only when the capacity of one bin is cut down so much that a gate has to be set at a very low opening. This is not advisable since a small gate opening (under one inch) restricts the flow abnormally and is not accurate. However, this is a rare condition and would probably occur only if the plant is operating at a reduced capacity.

To explain the operation of the plate feeder, first understand that this plate acts as a bottom for the hopper. Consequently, the weight of the material is directly upon it so that as the plate moves forward, material is carried with it through the gate. As it does so, the remaining material in the hopper slides down to take the place of the aggregate which has been carried forward. When the plate moves back, the material which was carried out cannot come back; instead, it simply drops off the plate onto the Mixer conveyor belt. Since this action is uniform as long as sufficient material is maintained in the hopper, the aggregate supply is easily and mechanically controlled.

Adjustment

To adjust one of the MEASURING GATES simply turn the adjusting nuts to raise or lower the gate. A circular INDICATOR on the screw gives a reading on the SCALE which corresponds to the opening between the bottom of the gate and the feeder plate, which is known as the "gate opening". The reciprocating feeder will need adjustment periodically to take care of the wear resulting from the continual sliding back and forth. Along the sides and back, SHIMS can be placed between the hopper and the feeder to keep material from leaking out. The adjustment of the stroke has been explained and is easily made since the connection consists only of a bolt and nut which fastens one end of the connecting rod to the crank.

NOTE: During operation, it is good practice to check the speed of the feeder occasionally, since the speed affects the feeding. This is done by counting the strokes of the feeder, which should be 40 per minute. To correct, adjust the throttle setting on the engine.

Soil Receiving Hopper

Function and Operation

The SOIL RECEIVING HOPPER (Fig. 75) is a small steel hopper located at the rear of the machine, which serves as a storage bin for the soil to be used in the mix. It is filled by hand-shoveling, and has a capacity of about a half cubic yard of material.

The soil is fed out from the hopper by a BAR FLIGHT FEEDER which consists of steel bars connected on each end to strands of chain, and spaced at regular intervals of about ten inches. These bars move slowly forward along the bottom of the hopper, carrying the soil through the SOIL MEASURING GATE.

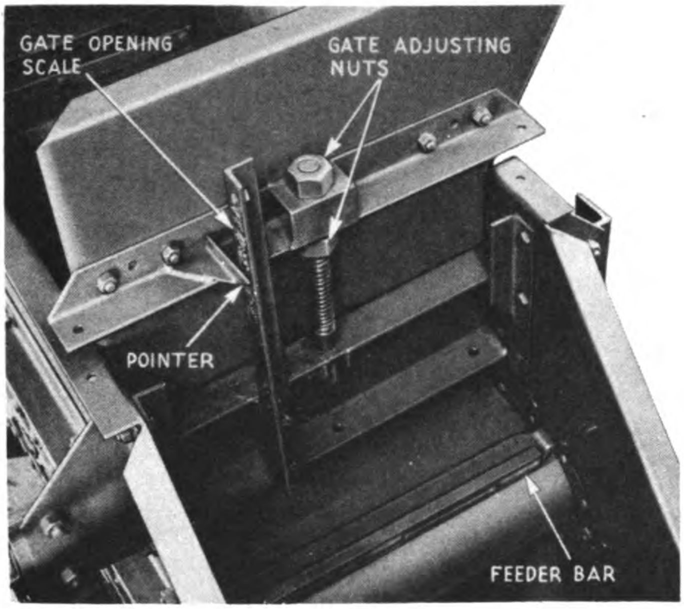


FIGURE 75

Soils hopper measuring gate showing adjusting nuts, gate opening scale, and pointer.

The measuring gate is similiar to the aggregate gates, consisting of a steel plate attached to an adjusting screw so that it can be moved up or down to control the amount of soil being added to the mix.

Adjustment

To adjust the measuring gate, it is necessary to turn the ADJUSTING NUTS to raise or lower the gate. The POINTER indicates the GATE OPENING on the SCALE which is attached to the gate.

The soil bar feeder requires inspection periodically. To take up slack in the chains, place shims between the two bearing bases on the foot shaft and their supports. The bars are subject to wear or breaking if a stone should happen to wedge in a tight spot. To repair it, break a chain and spread the strands to replace the damaged bar.

Soil Elevating Belt Conveyor

Function and Operation

The SOIL ELEVATING BELT CONVEYOR (Fig. 71) is used to raansfer the measured soil from the Soil Receiving Hopper to the Crusher Rolls. The soil drops from the hopper onto the low or foot end of the belt and is then carried up and dropped in between the rolls.

The conveyor consists of a 16" wide flat rubber belt which is driven by the HEAD PULLEY and supported by two horizontal ROLLER CARRIERS. Skirt PLATES, consisting of metal strips to which are fastened long, thin strips of rubber belting, line each side of the belt so that the soil is kept from falling off the flat belt. At the foot end, a small hopper is provided to

catch the soil as it falls from the Soil hopper. Strips of belting are fastened to the bottom of it to insure a good fit without wearing out the belt.

Adjustment

TAKE-UP SCREWS control the position of the foot shaft so that the belt may be adjusted for proper SLACK or for ALIGNMENT. These take-up screws are similiar to the larger ones used on the 841 Mixer conveyor, the same principle applying for adjustment.

Each take-up screw controls the position of one bearing. If the belt is running off one side of the pulley, adjust the screws to bring the belt back to center. If it is desired to take-up slack only in the belt, tighten both screws the same amount.

It is necessary to allow the belt to run for a few minutes before it can readjust istelf since it is a gradual process. Do not over-adjust because the belt does not react immediately.

The strips of rubber belting on the skirt plates and the small hopper are slotted so that they may be moved to take care of wear. Do not adjust them too tightly or the belt may be damaged.

Soil Crusher Rolls

Function and Operation

The function of the SOIL CRUSHER ROLLS, (Fig. 76) is to pulverize the lumps of soil so that the paddles in the pugmill can spread the soil particles uniformly through the mix. The crusher consists of two different

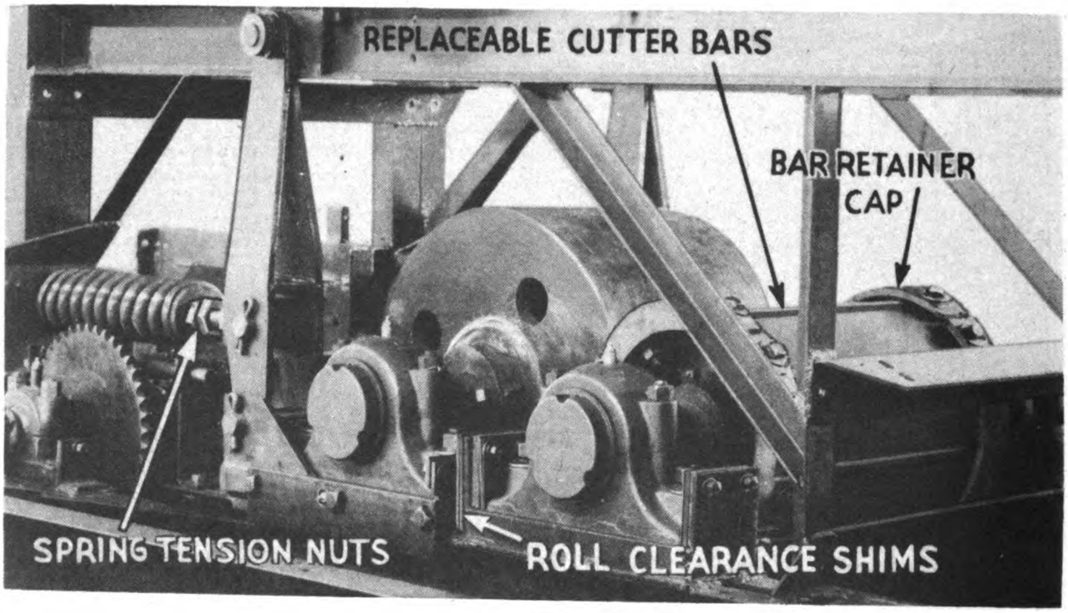


FIGURE 76
Soil Crusher Rolls

sized rolls running at different speeds and operating against each other. As the soil passes between the rolls, the lumps are crushed to fine particles which fall onto the 841 Mixer conveyor.

The 14" diameter roll is known as the cutter roll, since it has small, rectangular, hardened steel cutter bars clamped to the face of the roll. The other roll is 24" in diameter but its surface is smooth. The positions of the rolls is such that they operate with about one-sixteenth of an inch CLEARANCE DISTANCE between the extreme edge of the cutter bars and the face of the smooth roll. Therefore, it is the action of the fast-moving cutter bars that crush the soil lumps against the slower moving smooth roll.

Sometimes the soil contains stones or rocks which might damage the rolls or bars. As the larger rocks hit the cutter roll, they are thrown over the smooth roll where they fall out through a discharge chute. Smaller sized stones and gravel tend to pass between the rolls with the soil. To protect the rolls from shock, the smooth roll is not bolted in place. Instead, each of its bearings are mounted on a sliding bearing bracket, both of which are held in place by heavy springs. The tension in these springs is adjusted so that all clay or soil lumps or gravel will be crushed; but if hard, foreign particles should get between the rolls, the springs will give, allowing the brackets to slide back and increase the clearance between the rolls. As soon as the rock passes through, the roll slides back into position.

The tension in the two springs should be kept the same; likewise, the roll clearance should be the same all along the face of the roll. It is necessary to watch the crushed soil to see whether proper tension and clearance distance is being maintained. If sizable lumps of soil are passing through possibly because the soil or clay is wet, the clearance will have to be lessened to cut these lumps and if lumps are passing through because small bits of gravel are forcing the smooth roll back often, the tension in the springs should be increased. Do not increase tension more than required for good operation as a stray bolt, etc. might pass thru the rolls and damage them. Wet plastic clay might pancake through the rolls but this is not serious if it breaks up in the pugmill.

Adjustment

CLEARANCE OF ROLLS

To decrease the CLEARANCE DISTANCE between the rolls, measure the distance between a cutter bar and the face of the smooth roll to determine how many of the ROLL CLEARANCE SHIMS to take out on each side. These shims are placed between the fixed bearings of the cutter roll and the sliding bearing brackets of the smooth roll. (See Fig. 76).

To remove these shims first loosen the adjusting nuts and release all tension from the springs. Take out the small bolts which hold the shims in place and remove as many shims as necessary from the previous measurement. It may be necessary to drive these shims out, even though the pressure has been released by loosening the springs. After removing the correct thickness of shims, replace the bolts and tighten up the springs to get the proper tension.

REPLACE CUTTER BARS

To REPLACE CUTTER BARS which are worn out, loosen the bolts which hold the bar retainer caps that clamp the bars to the face of the roll. As soon as the caps are loose, the bars may be slid out and turned over to get additional wear or replaced with new bars, if necessary. These bars are made of special heat-treated steel for extra hardness for long wear. When replacing with new bars, be sure to check the roll clearance before operating to see that the new bars do not strike against the face of the smooth roll.

Operator's Platform

The operator's platform (Fig. 71) consists of a grillwork which is fastened over the shafting and soil conveyor around the aggregate hopper. Steps are provided for easy accessibility, and a seat which clamps to the grillwork is provided for the operator who controls the drag scoops. All the controls necessary to the operation of the machine can be reached from this platform.

Operating Levers (See Fig. 77)

1. MASTER CLUTCH LEVER

All the machinery on the 821 Soil-Preparation Unit is controlled by the master clutch lever which operates a friction clutch located in the speed reducer housing on the engine. Remember that this lever controls the heavy crusher rolls which should be started slowly and will continue to rotate for a short time after the clutch is disengaged.

2. MAIN JACK SHAFT LEVER

All the machinery except the crusher rolls is controlled by the main jack shaft lever which operates a friction clutch on the main jack shaft. The machinery should be stopped with this clutch when engaging or disengaging any of the feeder jaw clutches to prevent damaging the clutch jaws.

3. ENGINE THROTTLE LEVER

The engine throttle lever has two positions, for operating speed and idling speed, marked by two notches in the support bracket. The engine should operate at 1400 RPM under full load. After warming up the engine, advance the throttle to operating speed before engaging any clutches. This speed can be checked by counting the strokes of the feeder during operation which should be 40 strokes per minute.

4. RECIPROCATING FEEDER LEVER

The reciprocating feeder is controlled by a lever which operates a jaw clutch located on the feeder crank shaft. This feeder should be stopped by using the main jack shaft friction clutch so that both feeders will be stopped together.

5. SOIL FEEDER LEVER

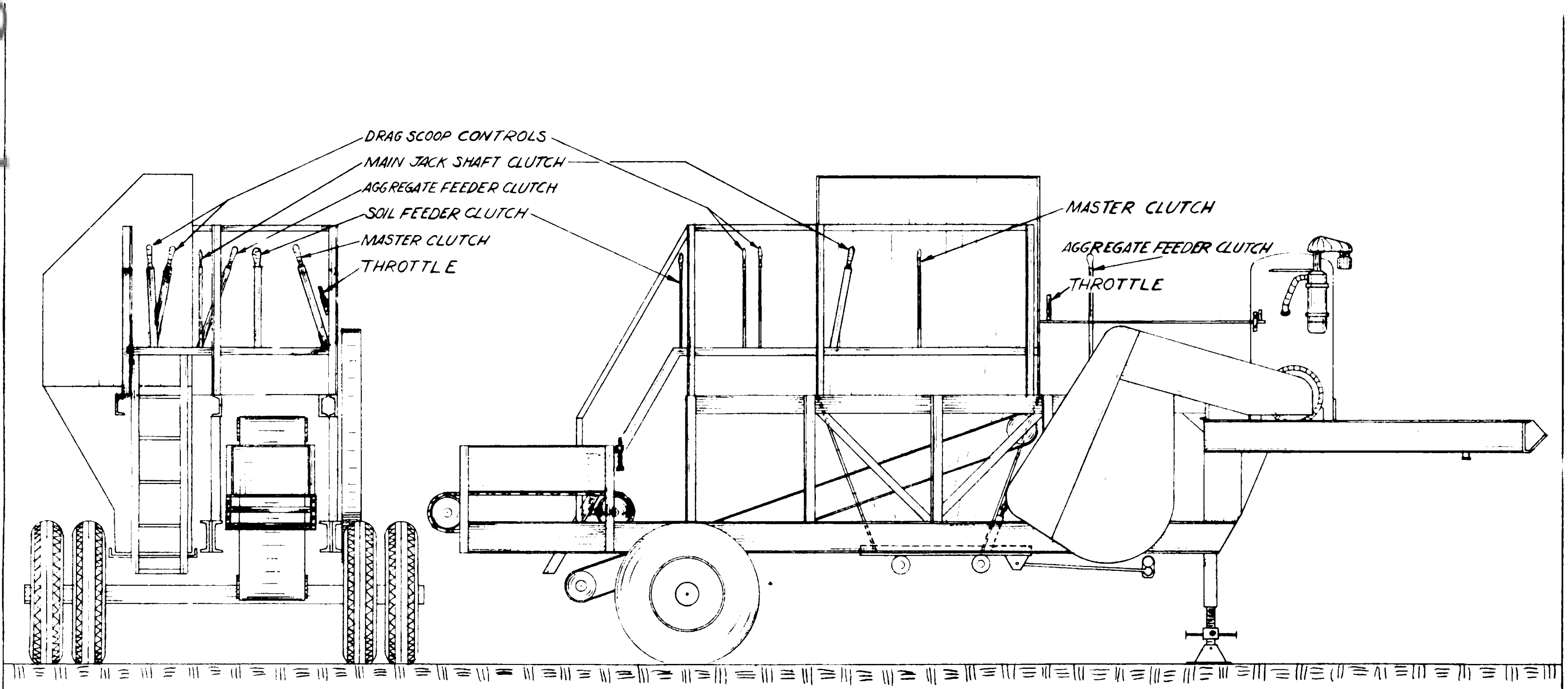
The soil bar feeder is controlled by a lever which operates a jaw clutch located on the soil feeder counter shaft. The main jack shaft friction clutch should be used to start and stop this feeder.

6. DRAG-SCOOP LEVERS

The drag scoops are controlled by levers which operate friction band clutches, and brakes located on the dragline shafts. These Scoops may be operated whenever the friction clutches are engaged. Only ONE drag scoop should be pulled IN at a time to prevent overloading the engine.

7. ELEVATOR LEVER

The bucket elevator is controlled by the Elevator control lever which operates a jaw clutch on the Elevator counter shaft. See "Clutch Lever", (Fig. 67).



821 SOIL PREPARATION UNIT OPERATING LEVERS

Figure 77

Before engaging the jaw clutch, it is advisable to stop machinery with a friction clutch to prevent damaging clutch jaws since the Elevator will have quite a drag on the engine.

8. PARKING BRAKE LEVER

The Parking brakes used to hold the machine are operated by a ratchet type control lever located just in front of the wheels on the right or off-road side.

Operating Personnel

The operation of the 821 Soil Preparation Unit in conjunction with the 841 Mixer on stabilization work will require a Machine Operator, Dragline Operator, Greaser and Six Laborers. This crew of nine men will be responsible to the Plant Superintendant for the efficient functioning of the machine. Qualifications and duties are briefly summarized as follows:

1. Machine Operator

This man should be experienced in the mechanical operation of heavy machinery and thoroughly familiar with the function, operation and adjustment of all working parts of the Soil Unit. This operator should be capable of directing the other members of the crew in the execution of their duties. He will control the mechanical operation of the machine.

2. Dragline Operator

This man should have some mechanical experience and will operate the dragline controls for the Scoops which supply aggregate to the 831 Elevator.

3. Greaser

This man should have some mechanical experience and a knowledge of the functional parts of the machine , their lubrication, and be capable of making mechanical adjustments as directed by the Machine Operator.

4. Laborers (six required)

Two men are needed to handle the Scoops on the dragline.

Two men, with shovels, are needed to properly feed the aggregate to the 831 Elevator

Two men with shovels, are needed to supply clay to the Soil Hopper on the machine.

Machine Operation

The Soil-Aggregate plant is set-up as described under the section "Plant Setup". However, some preliminary work is necessary before actual mixing can begin. Before operation, the plant should be thoroughly lubricated and the engines serviced according to instructions. While this is being done and supplies are being brought in, the soil gate and the aggregate gates should be set according to the charts and information given in the section "Construction Information". Also the crusher roll clearance should be checked and adjusted and the cutter bars replaced if necessary.

NOTE: During the description of the operation of the Soil Aggregate Plant, the operation of the 821 Soil Unit will be described in detail but the description of operation of the 841 Mixer will be referred to only, since they are described in detail under 841 Mixer Machine Operation.

The next step is to start the engine. After it is warmed up, advance to operating speed and operate each unit on the machine independently to check its operation for repairs and adjustments of such items as clutches and chains. When everything is functioning satisfactorily, operation of the plant can begin.

The first step is to fill the hoppers with material, using the bucket elevator and drag-scoops to fill the aggregate hopper and hand shoveling to fill the Soil hopper.

To fill the aggregate hopper, engage the master clutch, disengage the plate feeder and soil feeder clutch and then engage the main jack shaft friction clutch. When using the elevator, it is best to start and stop with the main jack shaft friction clutch to prevent jerking. Be careful not to shovel material in too close so that it will cause the elevator to buck and jerk when starting. As the two laborers shovel material to the buckets, two laborers handle the drag scoops which are controlled by the Dragline Operator seated on the machine. By engaging the drag scoop clutches, first on one shaft and then on the other, he can pull in the scoops as material is needed. The Soil hopper is filled by two laborers. When the hoppers are filled sufficiently, the men stop shoveling into the buckets and soil hopper; the master clutch can be thrown out, leaving the elevator engaged. When the Mixer is also ready to start, throw in the soil feeder and engage first the master clutch and then the main jack shaft friction clutch. It is good practice to wait until the rolls are operating at high speed before engaging the main jack shaft clutch, which controls the rest of the machinery, in order to reduce the load on the engine.

As soon as the soil reaches the crusher rolls, throw in the plate feeder which will start feeding aggregate. The Mixer Operator should have his conveyor and pugmill operating and as soon as material begins to flow into the pugmill, he should start the water pump and begin adding the necessary amount of water. The men now resume feeding the hoppers, using the scoops and elevator as before.

The Dragline Operator who controls the filling of the aggregate hopper can see the level of the material in the bins, therefore, it is up to him to direct those on the ground when to shovel material to the buckets. It is important that he maintain the level of the aggregate above the top of the gates, otherwise uneven feeding would result which would give improper proportioning and an unsatisfactory mix. If there should be a lag in the feeding, causing the level of the material to sink too low, he should throw out the main jack clutch, stopping all feeding, disengage the feeders, and then engage the main jack clutch again so he can fill the hopper. He must also watch to see that material does not build up in the hopper and arch over, resulting in uneven feeding.

The men feeding the elevator should try to keep out all oversize stones, roots, or other foreign material. Grizzly bar screens over the hopper are provided for this purpose also and will require occasional cleaning off. Likewise, the men feeding the soil hopper should be careful not to let foreign particles get in with the soil, since it might cause damage to the rolls. This soil hopper should be kept filled at all times.

The other Machine Operator controls the feeders, throttle and master clutch. Occasionally he should check the speed of the reciprocating plate feeder which should make forty strokes per minute. This is important since a change in speed will mean a corresponding change in the feeding of the aggregate. To correct it, adjust the throttle setting on the engine.

The main duties of the Machine Operator are to start and stop the feeders and to synchronize the operation of the Soil Preparation Unit with the Mixer and to check the operation of the soil crusher rolls for adjustment or repairs. By watching the condition of the soil as it is discharged onto the conveyor, the operator can tell when the rolls are functioning properly.

If occasional bits of clay or soil are passing through the rolls which will not be broken up by the paddles in the pugmill, the machine should be stopped and the roll clearance decreased. If small, uncrushed pieces of gravel are causing these lumps by spreading the rolls apart, increase the tension in the springs so this gravel will be crushed, as long as no damage to the rolls will result.

Dry clay or soil will pulverize easily as will sandy soils, but wet soils which contain a high percentage of clay will be hard to spread or pulverize. Do not let wet clay build up on the cutter bars or the shreading action will be hampered. When this wet clay soil is passing through without being shreaded into fine particles, adjustment to lessen the roll clearance is about the only thing that can be done.

It may be necessary to stop the machine occasionally to wait for trucks or material. When starting and stopping, remember to use the main jack and master friction clutches to save strain on the machinery. After the mixing job is finished, clean the machines and make ready for travel as described under the section "Plant Setup".

LUBRICATION INSTRUCTIONS

LUBRICANTS

Nothing can add to the life of the machine more than thorough lubrication of the moving parts, properly executed at the correct intervals. When time and availability of the machine are at a premium, it is absolutely inexcusable to have a breakdown resulting from improper lubrication, since this can so easily be avoided. A machine which cannot be used in an emergency because it requires repairing loses all its value and, instead, becomes a handicap. Therefore, it is very important to maintain the machine carefully, following the instructions which have been prepared.

LUBRICATION CHART KEY

Numbers appear inside symbols on the lubrication chart at every important lubrication point. The symbol indicates type of lubricant as shown below. The number indicates the paragraph giving detailed instructions on following pages.

○ HIGH PRESSURE GREASE

Operating Temp. °Fahrenheit	Commercial Grade & or Trade Name	Nearest U. S. Army Equivalent
Below 0°	Stazon (Light Oil-300S/100°F Viscosity - lime soap base)	#0 General Purpose Chassis Grease* #2-106
0° to 32°	Marfak #0	#0 General Purpose Chassis Grease #2-106
32° to 200°	Marfak #2; Superla 2X or their equivalents	#1 General Purpose Chassis Grease #2-107 #2 General Purpose Chassis Grease #2-108

HIGH TEMPERATURE GREASE

200° to 300°	Marfak #3; Kalrex #4; Superla 3X	#3 Heavy Duty Wheel Bearing Grease* #2-110
300° to 375°	Marfak #3; Kalrex #2	#3 Heavy Duty Wheel Bearing Grease* #2-110

* More frequent lubrication and greater care is required at these temperatures.

MOTOR OILS *

Below 0°	SAE-10)	U.S.Army Spec.#2-104-A of corresponding viscosity. Blend when correct viscosity is not available
0° to 32°	SAE-20)	
32° to 90°	SAE-30)	
Above 90°	SAE-40)	

TRANSMISSION LUBRICANT

Below 0°	SAE-80	Federal VV-L-761 SAE-80
0° to 32°	SAE-90	Federal VV-L-761 SAE-90
Over 32°	SAE-140	Federal VV-L-761 SAE-90; or SAE-80-140*

* SAE 80-140 can be used at - 20°F and above if other lubricants are not available.

NOTE: Do not use Hypoid lubricants

WATER PUMP GREASES

#4 Calcium Base Greases	#4 Water Pump Grease #2-109

841 MIXER LUBRICATION FREQUENCY CHART

EVERY TWO HOURS: Items - 5.

EVERY FOUR HOURS: Items - 14, 22, 23.

EVERY EIGHT HOURS: Items - 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29.

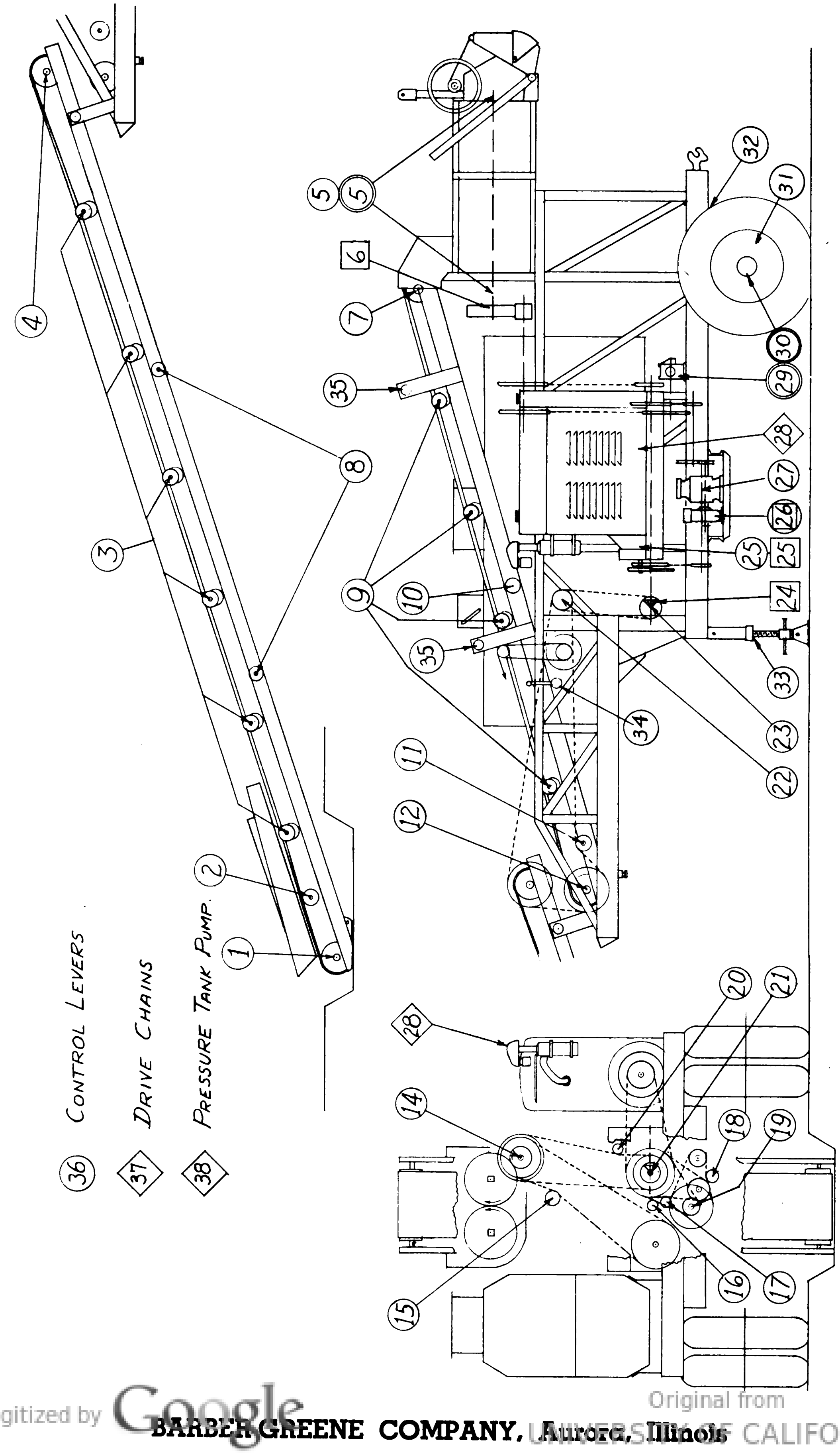
EVERY FIFTY HOURS: Items - 28, 36, 37.

EVERY 100 HOURS: Item - 28.

EVERY 200 HOURS: Items - 6, 24, 25.

AS REQUIRED: Items - 30, 31, 32, 33, 34, 35, 38.

841 Mixer Lubrication Chart



1. TELESCOPING CONVEYOR FOOT SHAFT

Two alemite fittings; one on each bearing. Grease every eight hours.

2. TELESCOPING CONVEYOR FLAT CARRIER

Two alemite fittings; one on each end of carrier. Grease every eight hours.

3. TELESCOPING CONVEYOR TROUGHING CARRIERS

Twelve alemite fittings; one on each end of six carriers. Grease every eight hours.

4. TELESCOPING CONVEYOR HEAD SHAFT

Two alemite fittings; one on each bearing. Grease every eight hours.

5. PUGMILL SHAFTS

Four alemites; one on each bearing at the ends of the two shafts. Grease fittings are piped up from bearings at discharge end for better accessibility. The forward bearing on the shaft on the engine side is piped out, the other forward bearing is easily reached from the burner platform side.

Grease every two hours, using high temperature grease when mixing materials at temperatures over 200° F.

6. PUGMILL GEAR CASE

Transmission lubricant capacity four quarts. Remove cover to check level daily; maintaining level so that pinion dips in oil. The pugmill gears do not dip in oil but are lubricated from the pinion. Change every 200 hours or whenever dirty.

7. FIXED CONVEYOR HEAD SHAFT

Two alemite fittings; one on each bearing. Grease every eight hours.

8. TELESCOPING CONVEYOR RETURN ROLLERS

Four alemites; one on each end of the two rollers; can be reached from below conveyor frame. Grease every eight hours.

9. FIXED CONVEYOR TROUGHING CARRIERS

Eight alemite fittings; one on each end of four carriers. Grease every eight hours.

10. FIXED CONVEYOR RETURN ROLLER

Two alemite fittings; one on each end of roller; can be reached from below conveyor frame. Grease every eight hours.

11. CONVEYOR DRIVE IDLER

One alemite fitting on end of idler pin. Grease every eight hours.

12. FIXED CONVEYOR FOOT SHAFT

Two alemite fittings; one on each bearing. Fittings are piped out in front of pulley. Grease every eight hours.

14. PUGMILL PINION SHAFT

Six alemite fittings. One fitting on bearing next to pugmill is piped out to side for easy accessibility. One fitting on pinion and one on the pinion shifter is reached easily from operator's platform. A fitting on the friction clutch hub and one on the other bearing is reached thru a hinged door in the guard which protects the clutch from dust. The clutch shifter is greased from the hoist platform in front of the engine. Grease bearings every four hours. Grease friction clutch, pinion and both shifters every eight hours. Do not grease friction clutch excessively, otherwise grease will be picked up by the bands and cause slippage.

15. KINNEY PUMP IDLER

One alemite fitting on end of idler pin; reached from beneath operator's platform. Grease every eight hours.

16. WATER PUMP COUNTER SHAFT IDLER

One alemite fitting on sprocket idler; can be reached from underneath engine. Grease every eight hours.

17. VIKING PUMP IDLER

One alemite fitting on end of idler pin; can be reached from directly underneath the machine. Grease every eight hours.

18. WATER PUMP IDLER

One alemite fitting on end of idler pin, can be reached from underneath the machine. Grease every eight hours.

19. WATER PUMP COUNTER SHAFT

To alemite fittings, one on each anti-friction ball bearing. One bearing can be greased from underneath machine, other is reached from under operator's platform. Grease every eight hours with not more than one stroke of the gun.

20. PUGMILL PINION SHAFT IDLER

One alemite fitting on end of idler pin; can be reached from beneath machine. Grease every eight hours.

21. MAIN JACK SHAFT

Six alemite fittings. One fitting on anti-friction roller bearing at engine drive end can be greased by removing small dust cap. One fitting on friction clutch hub is reached by sliding the cover off the dust guard. The fitting on the clutch shifter is reached from underneath the engine as are the fittings on the other clutch shifter and friction clutch hub. The other anti-friction bearing can be greased from under the operator's platform, removing the dust cap.

Grease the anti-friction bearings every eight hours with not more than two strokes of the gun. Excess grease will cause bearings to overheat, and will also damage grease seals.

Grease the shifters and clutches every eight hours with not more than two strokes. Excess grease will be picked up by clutch bands, causing slippage.

22. CONVEYOR DRIVE SHAFT

Two alemite fittings, one on each bearing; can be reached from underneath when standing on hoist platform on front of engine drive. Grease every four hours.

23. CONVEYOR BEVEL GEAR COUNTER SHAFT

Four alemite fittings, one on each bearing, one on shifter and one on sprocket. These fittings can be reached from hoist platform in

front of engine drive. Grease bearings every four hours, grease shifter and sprocket every eight hours.

24. BEVEL GEAR BOX

Transmission lubricant capacity three quarts. Check oil level daily by removing cover, maintain level so that gears dip in oil. Drain and refill every 200 hours or whenever dirty.

25. ENGINE SPEED REDUCER AND CLUTCH

Grease alemite fitting on housing every eight hours with not more than one stroke of gun. This is clutch throwout collar fitting so if greased excessively damage to clutch may result.

Use transmission lubricant in speed reducer, capacity 2-1/2 pints. Check level daily be removing oil level cap screw in end of housing near bottom, reached from underneath. Clean breather cap daily with gasoline and dip in oil. Drain and refill every 200 hours.

26. AMERICAN CENTRIFUGAL WATER PUMP

Two grease cups on pump bearings can be reached from underneath engine. Keep cups filled with Water Pump Grease and turn them down two turns every eight hours. If packing gland leaks more than a slight drip, tighten packing bolts a quarter turn at a time until leak stops.

27. VIKING TRANSFER PUMP

Three grease cups on pump and one alemite fitting on anti-friction outboard bearing. Grease cups can be reached from underneath machine. Keep cups filled with grease, turn cups down about two turns every eight hours. Use high temperature grease if asphalt is over 200°F. If pump leaks, tighten packing gland bolts until leak stops. Grease alemite fitting on ball bearing every eight hours with not more than one stroke of gun. This fitting can be reached from beneath machine.

28. Engine - Points to lubricate or service

    a. Crankcase

    b. Air Cleaner

    c. Oil Filter

    d. Water Pump

    e. Magneto

    See Engine Section for detailed instructions.

29. KINNEY METERING PUMP

Two alemite fittings, one on pump and one on anti-friction outboard bearing. Grease pump fitting from under operator's platform every eight hours. Use high temperature grease if asphalt is over 200°F. Grease outboard bearing from under platform every eight hours with not more than one stroke of the gun. Excess grease will cause ball bearing to overheat. If pump leaks, tighten packing gland nut.

30. WHEELS

The roller bearings in the wheels are packed with a water-repellent chassis lubricant. Check and repack yearly or every 5,000 miles. Use U.S.A. Heavy Duty Wheel Bearing Grease No. 3.

31. BRAKES

The brake cam shafts are lubricated by alemite fittings located at each support point. The needle bearing support at the wheel is piped down for accessibility. Each slack adjuster is fitted with one alemite. Grease all fittings periodically according to usuage. Use U.S.A. General purpose Grease No. 1.

32. SPRINGS

Each spring assembly is fitted with four alemite fittings, one at each support point on the spring shackles. Grease as required according to usage. Use U.S.A. General purpose chassis grease No. 1.

33. JACKLEGS

The jacklegs are lubricated with one alemite fitting apiece to facilitate turning. Lubricate as needed with U.S.A. general purpose chassis grease No. 1.

34. CONVEYOR HAND HOIST

The telescoping conveyor hand hoist is lubricated by five alemite fittings, two on the support bearings, one on each sheave and one for the gears. Lubricate, when required to facilitate cranking, with U.S.A. general purpose chassis grease No. 1.

35. TELESCOPING CONVEYOR SUPPORT ROLLERS

Six rollers, one alemite on each. Lubricate periodically to facilitate rolling the telescoping section of the conveyor up and down. Use U.S.A. general purpose chassis grease No. 1.

36. CONTROL LEVERS

All control levers are lubricated at support points by alemite fittings. These should be greased periodically to keep the controls from freezing, at least once a week. Use U.S.A. general purpose grease No. 1.

37. DRIVE CHAINS

Lubricate all drive chains with engine oil weekly. Under dusty conditions, remove chains periodically, wash in gasoline, oil thoroughly and replace to prolong life. Repeat this procedure before long shutdowns or storage periods. Use Motor Oil.

38. PRESSURE TANK PUMP

The leather cup washer on the pump plunger should be kept soft and pliable with oil. Unscrew the cap under the pump handle to gain access to the leather washer.

831 DRYER LUBRICATION FREQUENCY CHART

EVERY TWO HOURS: 1, 2, 16

EVERY FOUR HOURS: 7, 9, 10, 11, 13, 17

EVERY EIGHT HOURS: 2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 24

EVERY FIFTY HOURS: 8, 22, 23

EVERY 100 HOURS: 8

EVERY 200 HOURS: 2, 12, 14

AS REQUIRED: 18, 19, 20, 21

831 Dryer Lubrication Chart

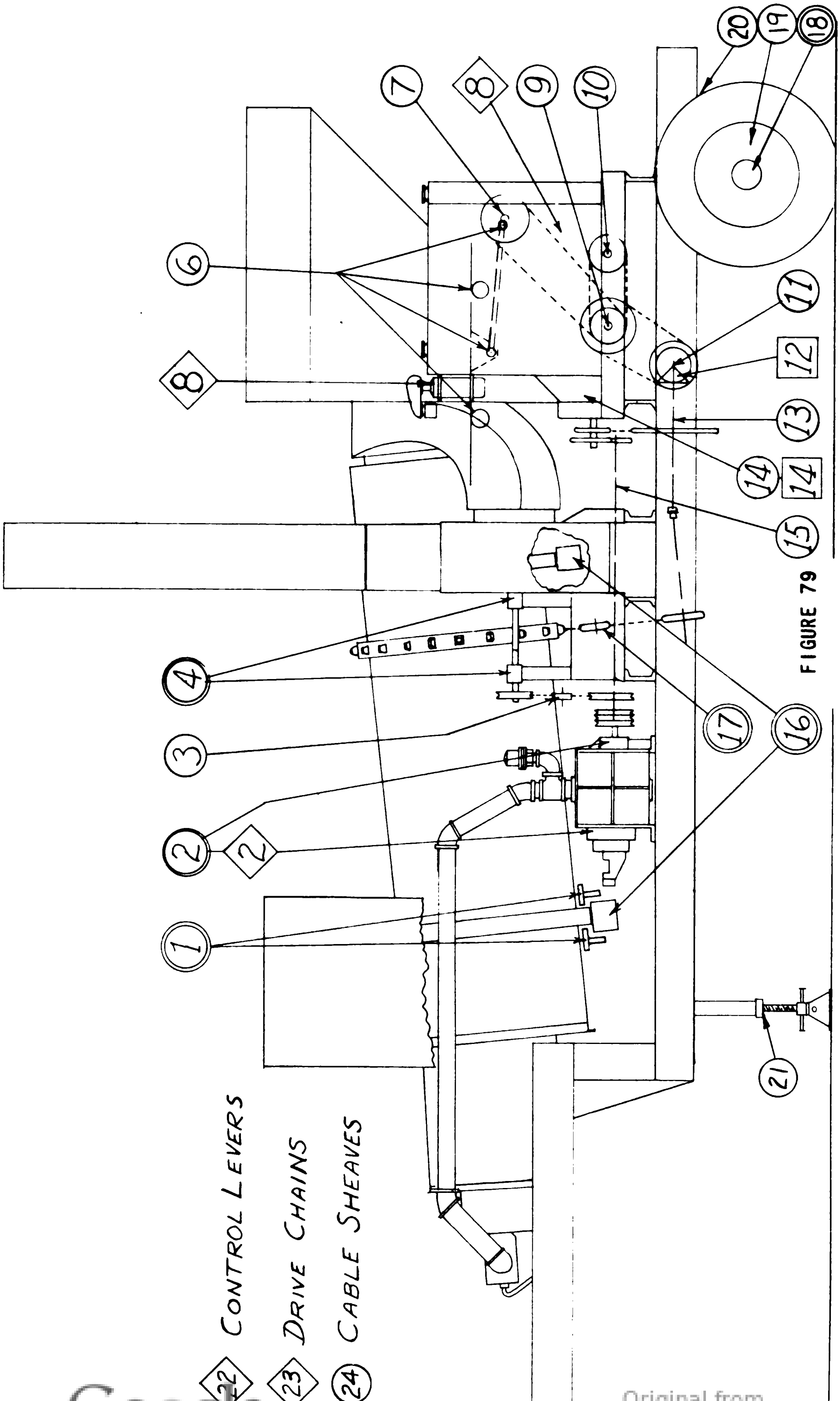


FIGURE 79

1. THRUST ROLLERS

Two rollers, one alemite fitting on each. Fitting is piped out to side of machine opposite engine. Grease every two hours, using high temperature grease.

2. BLOWER

Two grease cups, one engine oil reservoir. Fill grease cups every 200 hours with high temperature grease, turn cups down tight every eight hours. Maintain oil in reservoir up to level of pet cock. Drain and refill every 200 hours. Capacity of reservoir is 1-1/2 pints.

3. FAN V-BELT IDLER

One alemite fitting on idler pin, reached through slot in belt guard. Grease every eight hours.

4. EXHAUSTER FAN

Two alemite fittings, one on each anti-friction bearing. Grease every eight hours using high temperature grease, with not more than one stroke of gun. Excess grease will cause over-heating.

5. ENGINE AIR CLEANER

See Engine Section

6. PLATE FEEDER, ROLLERS AND CONNECTING ROD

Six alemites. One on each end of the roller shafts and one on each end of the connecting rod. Grease every eight hours.

7. FEEDER CRANK SHAFT

Four alemite fittings, one on each bearing, one on sprocket and one on shifter. Grease every four hours.

8. ENGINE CRANKCASE

Engine - Points to lubricate or service

a. Crankcase

b. Air Cleaner

c. Oil Filter

d. Water Pump

e. Magneto

See Engine Section for detailed instructions.

9. DRAGLINE SHAFT

Four alemite fittings: one on each of two bearings which are located outside the guard; one on shifter and one on clutch hub which can be greased by lifting up hinged door in guard. Grease bearings every four hours; clutch and shifter every eight hours with not more than two strokes. Be careful not to grease clutch and shifter excessively, otherwise grease may get on the bands causing slippage.

10. DRAGLINE SHAFT

Four alemite fittings: one on each of two bearings which are located outside the guard; one on shifter and one on clutch hub which can be greased by lifting up hinged door in guard. Grease bearings every four hours; clutch and shifter every eight hours with not more than two strokes. Be careful not to grease clutch and shifter excessively, otherwise grease may get on the bands causing slippage.

11. INTERMEDIATE JACKSHAFT

Two alemites, one on each bearing piped out to side opposite engine. Grease every four hours.

12. BEVEL GEAR BOX

Transmission lubricant capacity three quarts (Check daily). Maintain oil up to level of pipe plug on engine side of box. Drain and refill every 200 hours or whenever dirty.

13. MAIN JACKSHAFT

Six alemite fittings. One fitting on each of three bearings, all piped out to side of machine opposite engine. One fitting on universal, one on shifter and one on sprocket reached from under machine. Grease fittings every four hours.

14. SPEED REDUCER AND CLUTCH

Grease alemite fitting on housing every eight hours with not more than one stroke of gun. This is clutch throughout collar fitting so if it is greased excessively, damage to clutch may result. Use transmission lubricant in speed reducer, capacity 2-1/2 pints. Check level daily removing oil level cap screw in end of housing near bottom,

reached from underneath. Clean breather cap daily with gasoline and dip in oil. Drain and refill reducer every 200 hours.

15. FAN AND BLOWER JACKSHAFT

Four alemite fittings, one on each of two anti-friction ball bearings, one on shifter and one on sprocket. Fitting on bearing at pulley end is piped up and out through belt guard.

Grease bearings once every eight hours with not more than one stroke of gun. Excessive grease will cause bearing to overheat, damage grease seals. Grease shifter and sprocket every eight hours.

16. TRUNNION ROLLERS

Four rollers, one alemite fitting on each of two bearings on each roller shaft. Fittings are piped out to side of machine opposite engine. Grease every two hours with high temperature grease. Do not allow grease or oil to get on rollers or tires or slipping will result causing rollers to wear flat spots.

17. DRUM DRIVE IDLER

One alemite fitting on idler pin. Grease every four hours.

18. WHEELS

The roller bearings in each wheel are packed with water repellent chassis lubricant. Check and repack yearly or every 5,000 miles with U.S.A. heavy duty wheel bearing grease No. 3.

19. BRAKES

The brake cam shafts are lubricated by alemite fittings located at each support point. The needle bearing support at the wheel is piped down for accessibility. Each slack adjuster is fitted with one alemite. Grease all fittings periodically according to usage. Use U.S.A. general purpose chassis grease No. 1.

20. SPRINGS

Each spring assembly is fitted with four alemite fittings, one at each support point on the spring shackles. Grease as required for usage with U.S.A. general purpose chassis grease No. 1.

21. JACKLEGS

The jacklegs are lubricated with an alemite apiece to facilitate turning. Lubricate as needed with U.S.A. general purpose chassis grease No. 1.

22. CONTROL LEVERS

All control levers should be lubricated at support points. These should be oiled periodically, about once a week, to prevent them from freezing. Use Motor Oil.

23. DRIVE CHAINS

Lubricate all drive chains with engine oil weekly. Under dusty conditions, remove chains periodically, wash in gasoline, oil thoroughly and replace to prolong life. Repeat this procedure before long shutdowns or storage. Use Motor Oil.

24. CABLE SHEAVES

The dragline cable sheaves are fitted with one alemite fitting. Grease daily to keep them free turning. Use U.S.A. general purpose chassis grease No. 1.

831 ELEVATOR LUBRICATION INSTRUCTIONS

Frequency

Grease the following every four hours with high pressure grease.

1. Elevator Head Shaft

   Two Alemite fittings, one on each bearing.

2. Elevator Head Shaft Idler

   One Alemite fitting on idler pin.

3. Elevator Countershaft

   Four Alemite fittings, one on each bearing, one on sprocket, and one on shifter.

4. Elevator Drive Idler

   One alemite fitting on idler pin.

5. Bucket Line Idler

   Two Alemite fittings; one on each roller.

831 Bucket Elevator Lubrication Chart

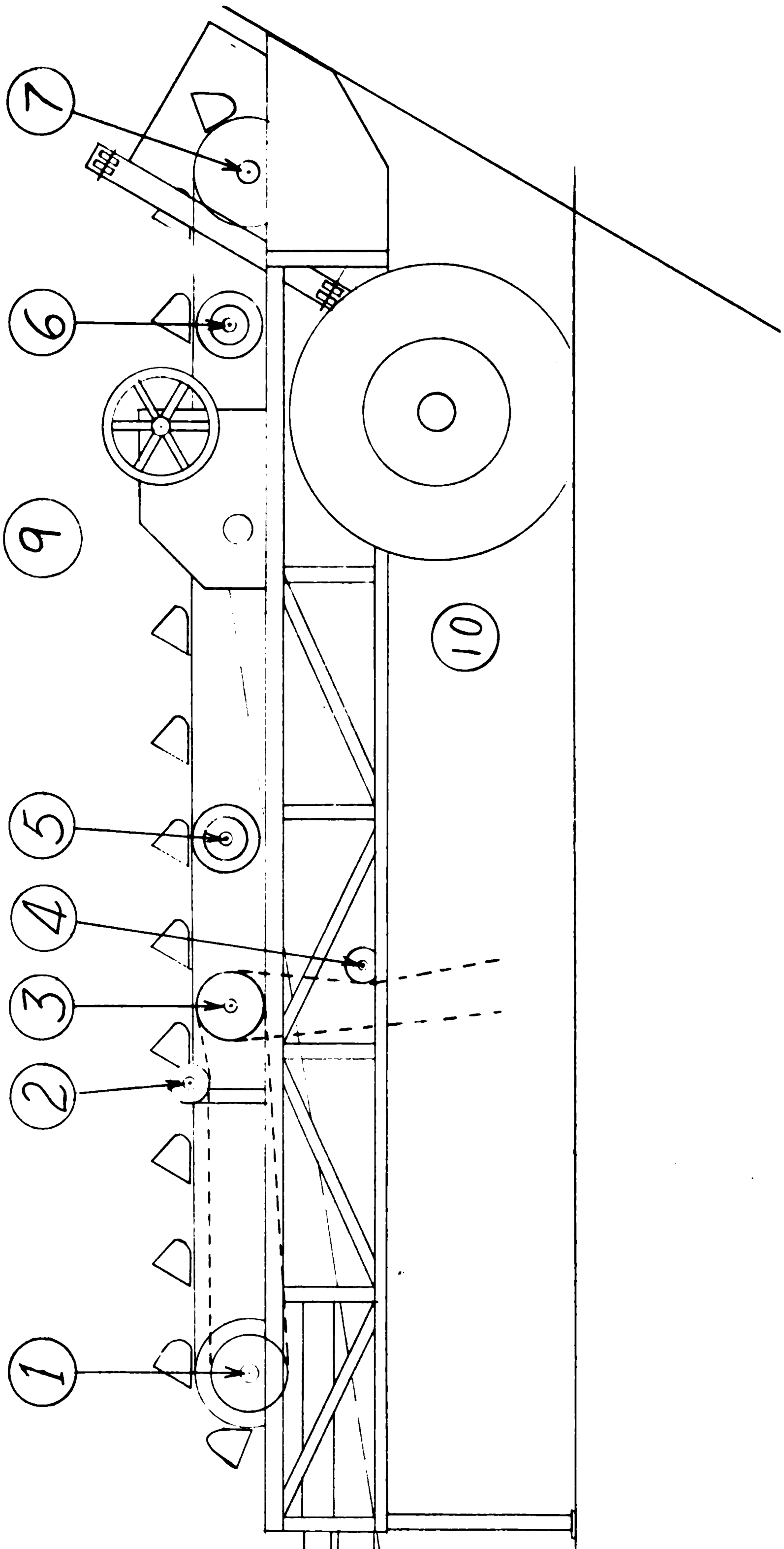


FIGURE 80

6. Bucket Line Idler

Two Alemite fittings; one on each roller.

7. Elevator Foot Shaft

Two Alemite fittings, one on end of each bearing.

Grease the following as required.

8. Cable Sheaves

Two sheave assemblies are lubricated by Alemite fittings. Grease as required to keep sheaves free turning.

9. Elevator Hand Hoist

Four Alemites, two on bearing supports and two for lubricating gear shaft. Lubricate as required to facilitate cranking.

10. Wheels

Wheel roller bearings are packed with heavy duty wheel bearing grease No. 3. Check and repack yearly or every 5,000 miles.

Springs

Three Alemites on each spring assembly at the support points. One at forward connection, two at spring shackle connection. Grease as needed according to usage.

Chains

Lubricate drive chain twice weekly with engine oil. Under dusty conditions wash them in gasoline and oil thoroughly at frequent intervals; to prolong chain life. This procedure should especially be repeated before long shut-downs or storage periods.

821 LUBRICATION INSTRUCTION FREQUENCY CHART

EVERY FOUR HOURS: Items 4, 5, 7, 8, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22, 24, 25, and 26

EVERY EIGHT HOURS: Items 1, 2, 3, 6, 9, 10, 14, 21, 23, 27, and 34

EVERY FIFTY HOURS: Item 1, 32, 33

EVERY ONE HUNDRED HOURS: Item 1

EVERY TWO HUNDRED HOURS: Items 14, 27

AS REQUIRED: Items 28, 29, 30, 31

1. Engine - Points to lubricate or service.

   a. Crankcase

   b. Air Cleaner

   c. Oil Filter

   d. Water Pump

   e. Magneto

   See Engine Section for detailed instructions.

2. Engine Air Cleaner
   (See Engine Section)

3. Main Jackshaft

Five Alemite fittings, one on each of the two anti-friction roller bearings, two on the double sprocket, and one on the clutch shifter.

Grease bearings every eight hours with not more than two strokes of the grease gun. The grease fittings on the bearings are protected from dirt by small caps on the top of the bearing housing. Excessive greasing will cause over-heating of the bearing and will also damage the grease seals.

Grease the sprocket and shifter every eight hours. Excessive grease here may be picked up by the friction band on the clutch and cause slipping.

821 Soils Unit Lubrication Chart

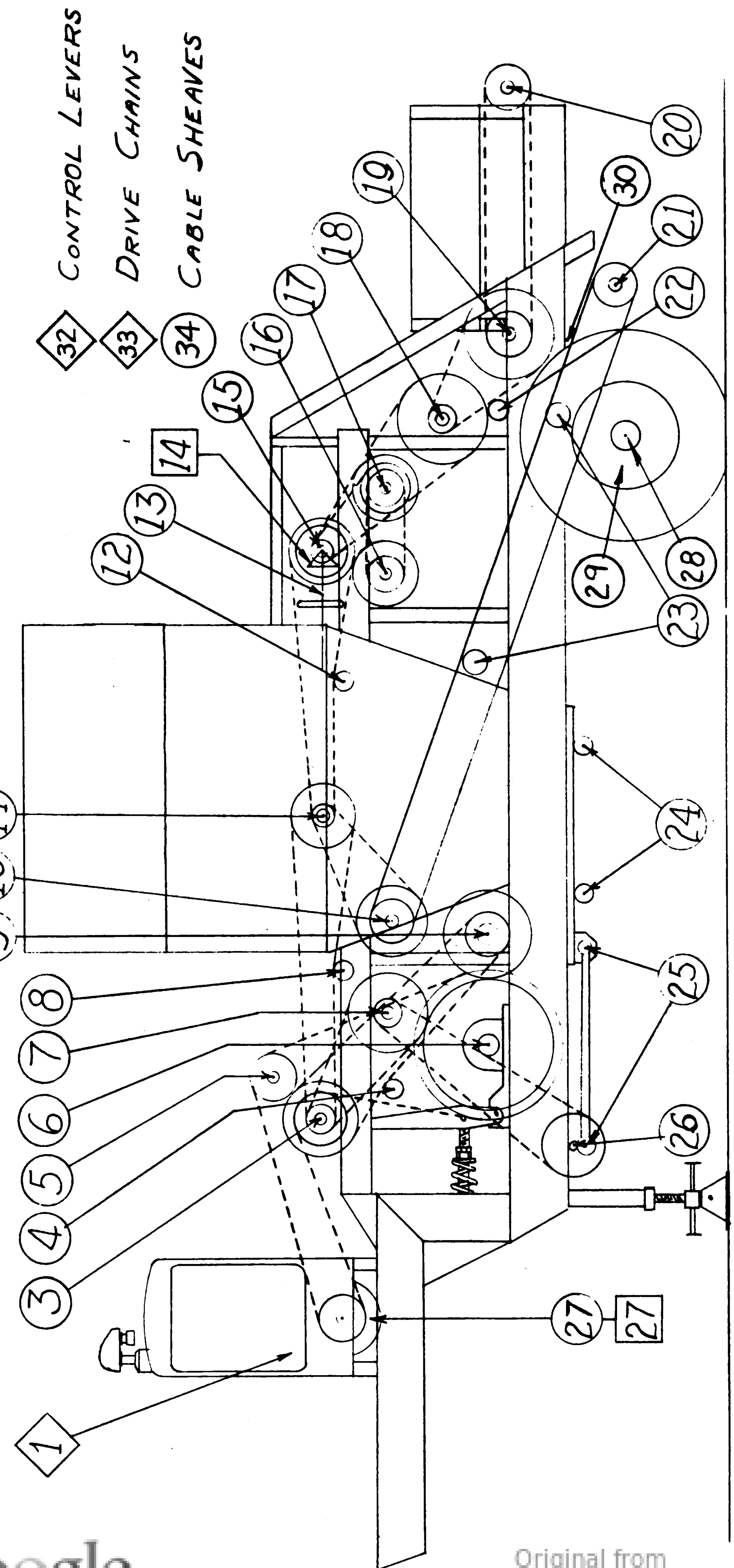


FIGURE 81

4. Cutter Roll Drive Idler

One Alemite fitting on idler pin. This fitting can be reached thru slots in the main drive chain guard. Grease every four hours.

5. Main Drive Pivot Idler

One Alemite fitting on idler pin. This fitting can be reached thru hole near top of main drive chain guard. Grease every four hours.

6. Smooth Roll Shaft

Four Alemite fittings. One fitting for each of the two anti-friction ball bearings on the shaft; one on each of the two sliding bearing support brackets. The bearing fitting and the sliding bearing bracket fitting on the sprocket end of the shaft are piped out from behind the chain guard near the large spring. The other two fittings can be easily reached from the other side of the machine.

Grease all bearings every eight hours with not more than two strokes of the gun. Excessive grease will cause these bearings to overheat and will also damage the grease seals. Grease the sliding brackets every eight hours.

7. Plate Feeder Countershaft

Four Alemite fittings; one on each of the two bearings, one on the shifter and one on the sprocket. These chains can all be reached from the hopper side of the machine. Grease every four hours.

8. Conveyor Countershaft Idler

One Alemite fitting on idler support pin. Grease every four hours.

9. Cutter Roll Shaft

Two Alemite fittings, one on each anti-friction ball bearing. The fitting on the bearing on the sprocket end of the shaft may be reached from the side of the chain guard. The other fitting may be reached from the hopper side of the machine.

Grease the ball bearings every eight hours with not more than two strokes of the gun. Excessive greasing will cause the bearings to overheat and will also damage the grease seals.

10. Conveyor Head Shaft

Two Alemite fittings, one on each bearing. Grease every eight hours.

11. Conveyor Countershaft

Two Alemite fittings; one on each bearing. The fitting on the inner bearing is piped up thru the guard over the main jackshaft lever. The other bearing can be reached thru the platform grill work. Grease every four hours.

12. Elevator Countershaft Drive Idler

One Alemite fitting on bearing bracket. Grease every four hours.

13. Elevator Bevel Gear Drive Shaft

Two Alemite fittings, one on each bearing. Grease every four hours.

14. Bevel Gear Box

Transmission lubricant, capacity three quarts. Check oil level daily maintaining level so that the gears dip in oil approximately 1". Drain and refill every 200 hours of operation or whenever the oil becomes dirty.

15. Elevator Bevel Gear Countershaft

Two Alemite fittings; one on each bearing. Grease every four hours.

16. Drag Line Shaft

Four Alemite fittings; one on each of two bearings, one on the shifter, and one on the clutch hub. These fittings can all be reached from underneath the shaft.

Grease bearings every four hours. Grease shifter and hub every four hours with not more than two strokes of the gun. Excessive grease here may be picked up by the friction bands causing clutch slippage.

17. Drag Line Shaft

Four Alemite fittings; one on each of the two bearings, one one the shifter, and one on the clutch hub. These fittings can be reached from underneath the shaft. Grease bearings every four hours. Grease shifter and hub every four hours with not more than two strokes of the gun. Excessive grease here may be picked up by the friction bands and cause clutch slippage.

18. Soil Feeder Countershaft

Four Alemite fittings; one on each of the two bearings, one on the shifter, and one on the sprocket. Grease every four hours.

19. Soil Feeder Head Shaft

Two Alemite fittings; one on each bearing. Grease every four hours.

20. Soil Feeder Foot Shaft

Two Alemite fittings, one on each bearing. Grease every four hours.

21. Conveyor Foot Shaft

Two Alemite fittings, one on each bearing. Grease every eight hours.

22. Final Drive Idler

One Alemite fitting on idler support shaft. Grease every four hours.

23. Conveyor Roller Carriers

Four Alemite fittings; two fittings on the end of each of two carriers. Grease every eight hours.

24. Plate Feeder Rollers

Four Alemite fittings; one on each end of the two roller shafts. The fittings on the inside end of the shaft may be reached only from underneath the machine. Grease every four hours.

25. Plate Feeder Connecting Rod

Two Alemite fittings, one on each end of the rod. Grease ·ery four hours.

26. Plate Feeder Crankshaft

Two Alemite fittings, one on each bearing. Grease every four hours.

27. Engine Speed Reducer and Engine Master Clutch

Grease Alemite on side of the clutch housing once daily, with not more than one stroke of the grease gun. This fitting is for the clutch throw-out collar; therefore, excessive grease may be picked up by the friction disc causing damage to the clutch.

Check transmission lubricant level in speed reducer daily as denoted by level cap screw on end of housing under each chain guard near the bottom of the speed reducer housing. Drain and refill every 200 hours of operation. Clean breather cap on top of housing daily with gasoline and dip in oil.

28. WHEELS

The roller bearings in each wheel are packed with water repellent chassis lubricant. Check and repack yearly or every 5,000 miles with U.S.A. heavy duty wheel bearing grease No. 3.

29. BRAKES

The brake cam shafts are lubricated by alemite fittings located at each support point. The needle bearing support at the wheel is piped down for accessibility. Each slack adjuster is fitted with one alemite. Grease all fittings periodically according to usage. Use U.S.A. general purpose chassis grease No. 1.

30. SPRINGS

Each spring assembly is fitted with four alemite fittings, one at each support point on the spring shackles. Grease as required for usage with U.S.A. general purpose chassis grease No. 1.

31. JACKLEGS

The jacklegs are lubricated with an alemite fitting apiece to facilitate turning. Lubricate as needed with U.S.A. general purpose chassis grease No. 1.

32. CONTROL LEVERS

All control levers should be lubricated at support points. These should be oiled periodically, about once a week, to prevent them from freezing. Use Motor Oil.

33. DRIVE CHAINS

Lubricate all drive chains with engine oil weekly. Under dusty conditions, remove chains periodically, wash in gasoline, oil thoroughly and replace to prolong life. Repeat this procedure before long shutdowns or storage. Use Motor Oil.

34. CABLE SHEAVES

The two dragline cable sheave assemblies are fitted with one alemite fitting apiece. Grease frequently to keep them free turning. Use U.S.A. general purpose chassis grease No. 1.

OPERATOR'S ADJUSTMENTS

THE BARBER-GREENE 8" FRICTION TYPE CLUTCH

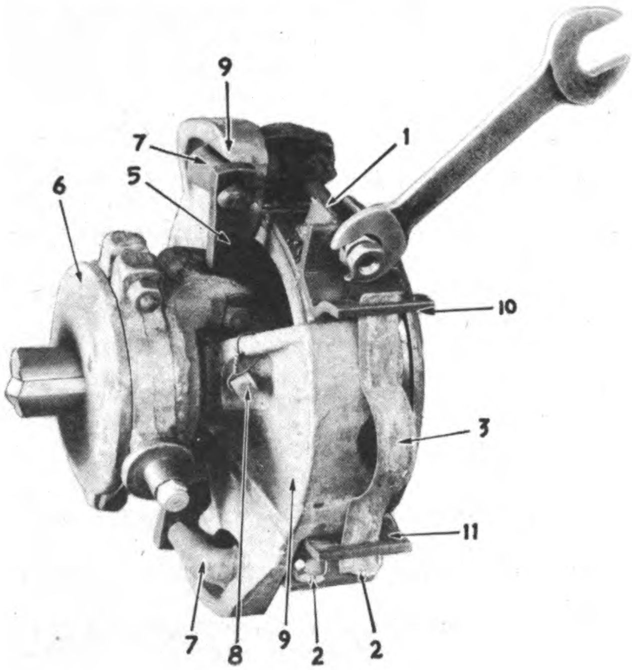


FIGURE 82

The Barber-Greene 8" clutch is known as the split band external contracting type because it consists essentially of two clutch bands that are compressed on a drum when the clutch lever is engaged.

Adjustments on the clutch are made at the adjusting bolts (1) on the photograph. To tighten clutch loosen the half nut on this adjusting bolt then turn down the inside nut about a quarter or half turn. Turn the

clutch half way around and repeat the same procedures on the opposite take-up bolt. Important: Be sure to take up an equal amount on both bolts. If this is not done the ends of both clutch bands nearest to the bolt taken up the most, will drag, resulting in damage to clutch. Try the clutch to see if the adjustment is correct; in other words, to give the desired pressure when engaged. If necessary to determine if both bolts have been taken up equally, proceed as follows:

Turn clutch over until the clutch band half having no shims at (10) and (11) between the spring clip and clutch carriers is accessible. Disengage clutch. Grasp firmly both clips that hold these springs in position with the fingers. If the clutch band is free on the drum, the take-up bolts have been tightened properly. If the band cannot be moved the bolts are not evenly adjusted and the clutch will drag. To correct proceed as follows: Check the clearance between the spring clip and carrier castings (9) at (10) and (11). You will find there is no clearance at one end and possibly a quarter inch at the other. Therefore, the bolt at the end having one-quarter inch clearance must be loosened and the opposite take-up bolts tightened until the clutch band has been centered having equal clearance at (10) and (11). Then continue to tighten bolts evenly until the clutch is in proper adjustment. When in proper adjustment, the clutch lever will engage in a distinct snap as the shifter yoke throws past center. Should the band become greasy, the clutches may slip although they are already sufficiently tight. In such case, wash clutch and band with gasoline. A new clutch may require several adjustments until friction bands wear in.

BARBER-GREENE EXTERNAL BAND BRAKE

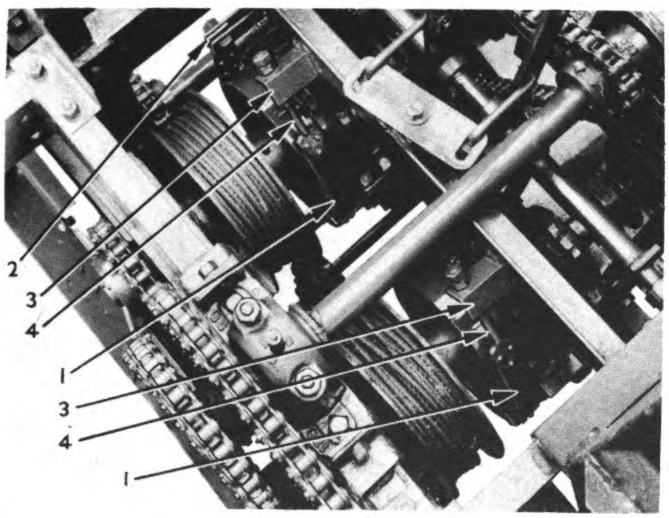


FIGURE 83

This external band brake is a simple form of brake used in conjunction with the 8" clutches on the dragline mechanism. It consists of a circular band (1) connected at one end to the lever shifter (2) and anchored at the other end to a support (3). The anchor is effected by a bolt (4) riveted to the end of the band passing through a hole in the support and held in place there by two nuts. This is the adjustment, since to tighten the brake all one has to do is to loosen the lock nuts and turn the inner nuts down enough to take up so that the brake could be engaged when the lever is at the proper position.

Note: Brake adjustment should be checked to be sure the 8" clutch is completely disengaged before the brake sets as follows:

1. With the clutch engaged, check the brake band to be sure that it is free on the drum.

2. With the brake set, check the clutch bands to see sure they are free, as per instructions under 8" clutch, Page 81.

3. Both brake and clutch bands should be free when lever is in neutral.

MASTER CLUTCH

The master clutch on the engine is a single plate dry type twin disc clutch. If this clutch does not pull, or if the operating lever jumps out, the clutch must be adjusted.

To adjust the clutch, remove the band hole cover plate on the top of the speed reducer and clutch housing which is held in place by two small screws. Turn the clutch over until the adjusting lock pin 1 can be reached. Pull this adjusting pin out and hold it out since it is backed by a spring so that the adjusting yoke 2 can be turned to the right or crosswise (If the clutch needs to be tightened) until the clutch lever requires a distinct pressure to engage. Release the adjusting pin. Replace the hand hole

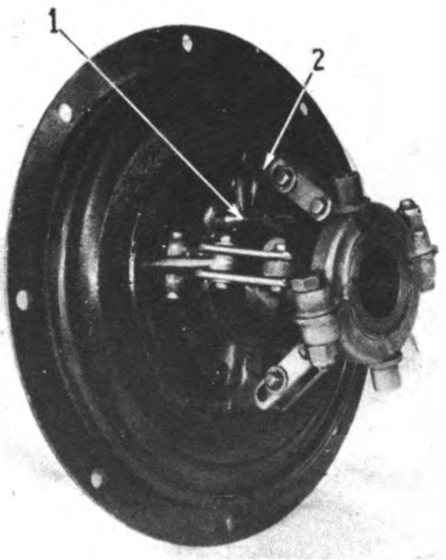


FIGURE 84

Engine master clutch showing adjusting lock pin and adjusting yoke.

cover plate. A new clutch requires several adjustments until the friction discs are worn in.

Note: Be very careful when greasing clutch shifter. Alemite fitting on side of housing should not grease more than necessary. See Lubrication Chart. Excessive grease may be picked up by the friction disc which may ruin the clutch.

841 MIXER CHAIN ADJUSTMENT

1. Main Drive Chain (engine to main jackshaft)

The main drive chain is adjusted by varying the distance between the engine and the main jackshaft. This is done by shifting the engine thru the use of adjusting bolts on the inner engine sill.

To adjust the chain to proper tension, first loosen the bolts connecting the chain guard to the speed reducer housing. Loosen the two bolts in the light bracket supports so that the light brackets will move with the engine sill. Loosen the four engine sill hold-down bolts, then take up on the adjusting bolts to shift the engine to the desired position. IMPORTANT: Turn the adjusting bolts exactly the same amount to maintain sprocket alignment. After the engine has been shifted enough to get correct slack in the chain; tighten the adjusting nut and the hold-down bolt. Then tighten the engine light bracket connection and the chain guard connection.

2. Pugmill Pinion Shaft Drive Chain

Proper adjustment of this drive chain is maintained by a spring loaded idler sprocket. While in operation there should be no slack in this chain. To tighten the chain loosen the lock nut on the threaded spring take-up rod and turn down on the adjusting nut till all slack is removed, then tighten the lock nut. Do not put extreme tension in this chain.

3. Elevator Bevel Gear Shaft to Elevator Drive Shaft

This chain is adjusted with no slack when installed. If the chain becomes slack it is necessary to shim the conveyor drive shaft away from the conveyor bevel gear shaft by inserting shims between the bearing and the stop angle. This is done also by removing a half link from the chain.

4. Conveyor Drive Chain

This chain is properly adjusted at all times by a weighted type idler sprocket. If the chain becomes too slack even with this weighted type sprocket, it is necessary to break the chain and remove enough links so the weighted idler will give the correct slack adjustment.

5. Viking Pump Drive Chain

The Viking Pump drive chain is adjusted by a movable sprocket idler running against the slack run of the chain. To remove excessive slack in this chain the idler bracket can be moved thru the multiple holes in the support and the slotted holes in the bracket. This gives a very wide range of adjustment. When adjustment is all taken up, it is necessary to remove a link from the chain and start over.

6. Water Pump Countershaft Drive Chain

The water pump countershaft drive chain is adjusted by a movable sprocket idler running against the slack run of the chain, similiar to the Viking Pump drive chain. To take up excessive slack move the sprocket idler against the slack run of the chain using the multiple holes in the bracket support and the slotted holes in the bracket to get a wide range of adjustment.

7. Water Pump V-Belt

The water pump V-belt, is kept in proper adjustment by a spring loaded idler. The tension in this V-belt should not be great, only enough to

keep the belt from slipping. To take up on the belt, loosen the lock nut on the threaded adjusting spring rod, turn down the inside nut until the proper tension is reached then tighten the lock nut.

8. Kinney Pump Drive Chain

The Kinney pump drive chain is kept in proper adjustment by a movable sprocket idler running against the slack run of the chain. Multiple holes on the mixer frame support and slotted holes in the idler bracket allow a wide range of take up, however, when changing to different sizes of sprockets under pump and drive sprockets, it may be necessary to remove or add links to the chain to get within the proper adjustment.

831 DRYER CHAIN ADJUSTMENT

1. Main Jackshaft and Fan and Blower Jackshaft Drive Chains

The two main drive chains are adjusted together by varying the distance between shaft and the engine by shifting the position of the engine through the use of adjusting bolts which are fastened to the inner engine sill.

If both chains cannot be adjusted to proper slack by shifting the engine, it may be necessary to use an offset link in one of the chains or even to shift the position of the fan and blower jackshaft by shimming the bearings.

To adjust the chains by moving the engine, loosen the four engine sill hold-down bolts, then loosen the adjusting bolt lock nuts and turn the adjusting bolts to shift the engine to get the desired slack. IMPORTANT: - Turn the adjusting bolts exactly the same amount to maintain sprocket alignment. After the engine has been shifted enough to get the correct slack, tighten the adjusting nuts on the adjusting bolts and tighten the hold-down bolts.

2. Drum Drive Chain

Proper adjustment of the drum drive chain is maintained by a spring loaded idler sprocket. While in operation there should be no slack in this chain. To remove slack from this chain, it is necessary to increase the tension on the idler spring by loosening the lock nut on the threaded take-up rod, turning down the adjusting nut until the slack is removed, then tightening the lock nut. Do not put extreme tension on the chain.

3. Intermediate Jackshaft To Dragline Shaft Drive Chain

This chain is adjusted with no slack when installed. If the chain becomes slack, it is necessary to shim the dragline shaft away from the bevel gear shaft by inserting shims between the bearings and the stop angles. It may be convenient also to remove a half link from the chain.

4. Dragline Shaft Drive Chain

The chain between the two dragline shafts is installed with no slack. Since it is a very short chain, it will possibly never need adjusting except if one of the shafts position is shifted. In this case it will be necessary to shim the driven dragline shaft away by inserting shims between the bearings and the stop angles or removing a half link from the chain.

5. Feeder Crankshaft Drive Chain

The feeder crankshaft drive chain is adjusted with no slack when installed. If the chain should become slack during operation, it is necess-

ary to shim the feeder crankshaft away from the drive shaft by inserting shims between the bearings and the stop angles. It may also be necessary when doing this to remove a half link from the chain by using an offset link.

6. Exhauster Fan V Belt

The exhauster fan V belt is kept at proper tension by a spring loaded roller bearing idler. The tension in this V belt should not be great, only enough to keep the belt from slipping. To take up on the belt, loosen the lock nut on the threaded adjusting spring rod, turn the inside nut don down until the proper tension is reached, then tighten the lock nut.

7. Blower V-Belts

The three V belts which drive the blower are installed with proper adjustment. If they should become slack during operations so that slipping results, it is necessary to loosen the blower hold-down bolts and shift the position of the blower until the belts are tight.

831 ELEVATOR CHAIN ADJUSTMENT

1. Head Shaft Drive Chain

The head shaft drive chain is adjusted by a movable sprocket idler running against the slack run of the chain. To remove excessive slack from this chain, the idler brackets can be moved since there are multiple holes in frame support and slotted holes in the bearing bracket. This gives a very wide range of adjustment. When the adjustment is taken up, it is then necessary to remove a link from the chain and start over.

2. Elevator Countershaft Drive Chain

The elevator countershaft drive chain is the powered take off chain which drives the elevator from either the Soil Unit or the Dryer. There are two links of chain, one for the Soil plant set-up containing 128 links, and one for the Bituminous Plant set-up containing 164 links. This chain is kept at proper slack at all times by a weighted type idler sprocket. This idler sprocket is bolted to the elevator frame for traveling so that the sprocket will not swing back and forth. If the chain should develop excessive slack during operation so that the weighted idler no longer keeps it at the proper tension, it is necessary to break the chain and remove a link.

3. Elevator Bucket Line

The elevator bucket lines are adjusted for proper slack by moving the headhhaft by means of the two threaded adjusting screws which bear against the shaft bearing. To make this adjustment, therefore, it is necessary to loosen the lock nuts on the adjusting screw, then turn the adjusting screw to get the proper tension locking it in place with the nuts.

821 SOIL PREPARATION UNIT CHAIN ADJUSTMENT

1 - MAIN DRIVE CHAIN

The main drive chain is kept at proper adjustment by the main drive pivot idler. This idler is mounted on a bracket with slotted holes which is fastened to the frame. Multiple holes in this frame support and slotted holes in the idler bracket give a wide range of adjustment.

2 - CUTTER ROLL DRIVE CHAIN

Proper adjustment of the cutter roll drive chain is maintained by a small idler sprocket bolted to the drive chain guard. Multiple holes in this guard allow the idler to be moved through a wide range of adjustments.

3.- CONVEYRR COUNTERSHAFT DRIVE CHAIN

The conveyor countershaft drive chain can be adjusted for proper slack by moving a small idler sprocket which is bolted to the main frame. Multiple holes provide a wide range of adjustment.

4 - PLATE FEEDER COUNTERSHAFT DRIVE CHAIN

The plate feeder countershaft drive chain is installed with no slack. If the chain becomes slack after a period of running in, it is necessary to shim the countershaft away from the jackshaft by inserting a stop shim between the bearings and the stop angles. At the same time it is necessary to adjust the plate feeder crankshaft drive chain as it will be affected also.

5 - PLATE FEEDER DRIVE CHAIN

The plate feeder drive chain is installed with no slack. After a period of running-in it should become slack, it will be necessary to shift the position of the plate feeder crankshaft by inserting stop shims between the bearings and stop angles or by removing a link from the chain.

6 - SOIL CONVEYOR DRIVE CHAIN

Soil conveyor drive chain is a very short chain and is installed with no slack. If it should become slack after a period of operation, it will be necessary to shift the position of the headshaft by shifting the bearing stop blocks.

7 - BEVEL GEAR COUNTERSHAFT DRIVE CHAIN

Proper adjustment of the bevel gear countershaft chain is maintained by an idler sprocket. This idler sprocket is bolted to the frame with a series of multiple holes to give a wide range of adjustment.

8 - ELEVATOR DRIVE CHAIN

This drive chain is kept in proper adjustment at all times by a weighted idler sprocket fastened to the frame of the 831 elevator.

9 - SOIL FEEDER COUNTERSHAFT DRIVE CHAIN

This chain is installed with no slack, provisions for taking up slack being provided by shifting the position of the countershaft. This is done by inserting stop shims between the bearings and the stop angles. When this adjustment is made it is necessary also to adjust the soil feeder drive chain since its position will be affected.

10 - DRAGLINE SHAFT DRIVE CHAIN

The chain from the bevel gear countershaft to the dragline shaft is a very short chain and installed with no slack. To keep it in proper slack, it is necessary to shift the position of the dragline shaft.

11 - DRAGLINE SHAFT DRIVE CHAIN

The drive chain between the two dragline shafts is kept properly adjusted by shifting the position of the shafts.

12 - SOIL FEEDER DRIVE CHAIN

The chain from the soil feeder countershaft to the soil feeder head shaft is kept in proper adjustment by a small idler sprocket which is bolted to a frame upright angle. Slots in the bracket allow the idler to be moved for adjustment.

13 - SOIL FEEDER FLIGHT CHAIN

To tighten the soil feeder flight chain, increase the distance between the head shaft and foot shaft by inserting shims between the bearing base and the bearing support of the foot shaft.

MAINTENANCE MANUAL

CONTENTS

BARBER-GREENE COMPANY, Aurora, Illinois

Model 831 Dryer

Model 821 Soil Preparation Unit

Barber-Greene 8" Friction Clutch

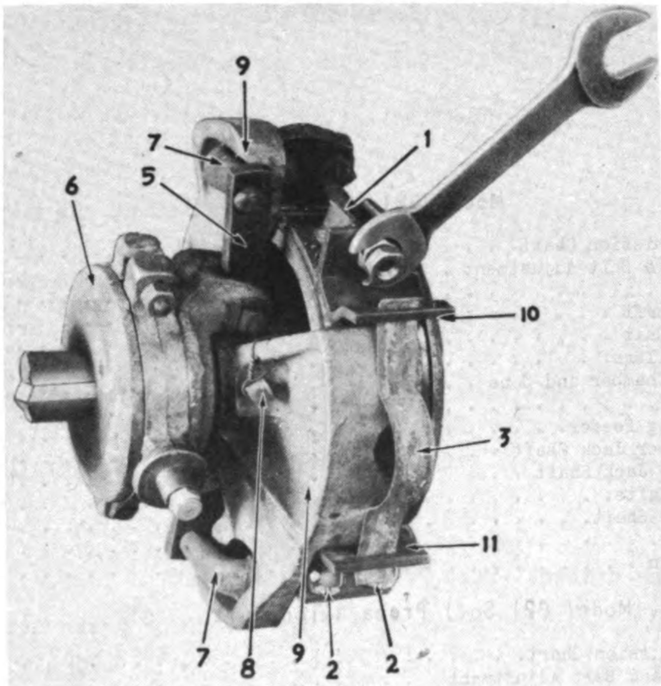


FIGURE 100

How To Remove and Replace Bands and Linings

The clutch bands are removed and replaced by performing the following steps:

Remove both the adjusting bolts 1, Fig. 100.

Remove all four bolts 2. The slotted nuts on these bolts are held in place by cotter pins.

Remove both spring bands 3.

Remove the toggle pins 4, which secure the toggle links 5, to the shifter collar 6.

Remove both main clutch levers 7.

Loosen both set screws 8, and the clutch carrier 9, and slide the clutch carrier 9, back on shaft away from the clutch drum and remove band. When sliding the carrier back be sure that the clutch bands remain in position on the clutch drum as this will simplify their removal.

CAUTION: Note the position of the bands on the drum so they may be replaced in this same position. Do not remove the shims found on one clutch band.

Pry the old lining from the clutch band half and remove the brass rivets with a chisel. Install new lining. This is done by placing the lining in place on the clutch band half so that the holes in the lining and shell are aligned. Secure with brass rivets provided, making sure the rivet heads are imbedded in the lining so that rivet heads will not drag on the clutch drum.

Place the relined bands into original positions on the drum and slide the carrier back in place. Turn down set screws on carrier hubs 9, and wire.

Insert the main clutch levers 7, through the holes in carrier 9.

Insert the four bolts 2, in place and start slotted nuts on bolts.

Insert the take-up bolts 1, and start nut on bolt.

Secure toggle link 5, to shifter collar 6, with toggle pin 4.

Engage clutch.

With clutch engaged, turn down the same amount the nuts on both adjusting bolts 1, so they will be snug.

With clutch engaged, turn down the same amount the slotted nuts on the remaining four bolts 2, until the bolts are tight enough so they cannot be moved with the fingers. Before inserting cotter pins, through nuts and bolts, disengage and engage the clutch several times and check bolts to make certain the bolts are tight when clutch is again engaged. It is very important that these bolts are evenly tightened to maintain proper surface contact with clutch band and drum when clutch is engaged.

See "How To Adjust Clutch" in Operators Section for the final clutch adjustment.

Barber-Greene External Band Brake for 8" Clutch

This external band brake is a simple form of brake used in conjunction with the 8" clutch. It consists of a circular band 1, Fig. 101 connected at one end to the shifter lever 2, and anchored at the other end to a support 3. The anchor is effected by a bolt, 4, which is riveted to the end of the band, passing through a hole in the support and held in place there by two nuts.

Brake is adjusted by means of bolt 4. See Operators Section for instructions.

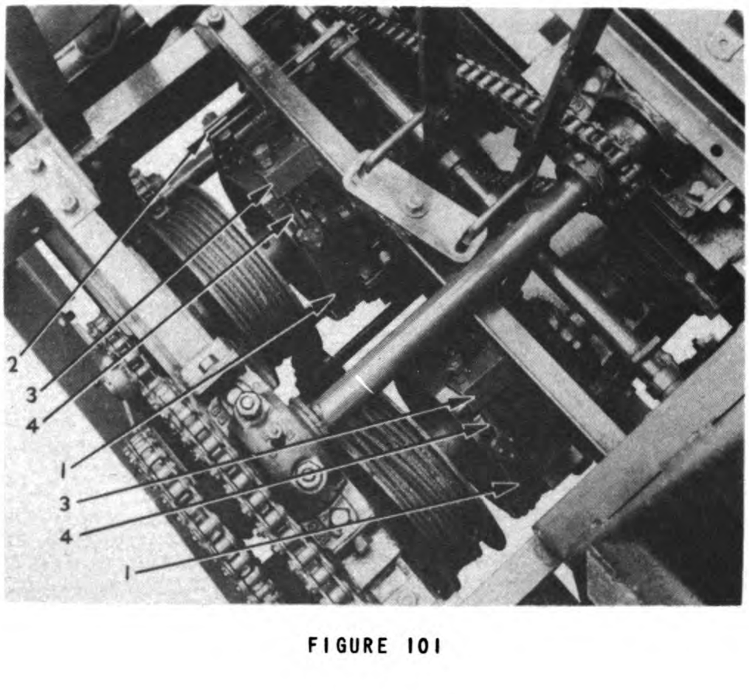
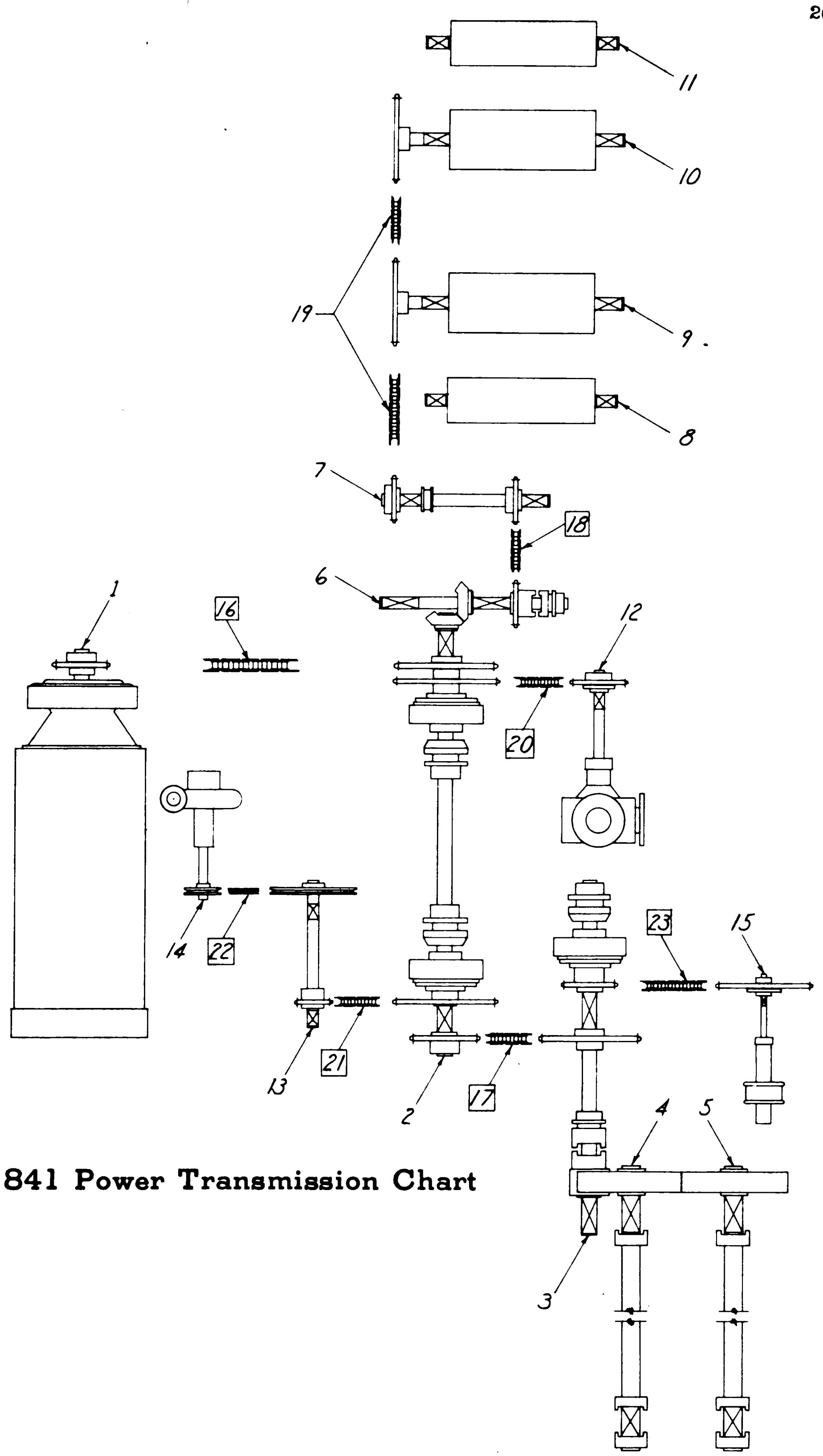


FIGURE 101



841 Power Transmission Chart

FIGURE 102

841 Power Transmission Chart

Shafting Identification and Speeds

		R.P.M.
	Engine	1400.0
1 -	Reducer Take-off	357.1
2 -	Main Jackshaft	205.6
3 -	Pugmill Pinion Shaft	137.0
4 -	Pugmill Shaft (Engine Side)	52.0
5 -	Pugmill Shaft (Opposite Engine Side)	52.0
6 -	Bevel Gear Countershaft	205.6
7 -	Conveyor Drive Shaft	205.6
8 -	Fixed Conveyor Head Shaft	102.8
9 -	Fixed Conveyor Foot Shaft	102.8
10 -	Telescoping Conveyor Head Shaft	102.8
11 -	Telescoping Conveyor Foot Shaft	102.8
12 -	Viking Pump Shaft	397.0
13 -	Water Pump Countershaft	605.0
14 -	Water Pump Shaft	1470.0
15 -	Kinney Pump Shaft	varies with sprocket sizes
	Fixed Conveyor Belt Speed	215 F.P.M.
	Telescoping Conveyor Belt Speed	215 F.P.M.

Drive Chain and Belt Identification

16 - Main Jackshaft Drive Chain
17 - Pugmill Pinion Shaft Drive Chain
18 - Conveyor Countershaft Drive Chain
19 - Conveyor Drive Chain
20 - Viking Pump Drive Chain
21 - Water Pump Countershaft Drive Chain
22 - Water Pump Drive "V" Belt
23 - Kinney Pump Drive Chain

Drive Chain and Belt Adjustment

1. Main Jackshaft Drive Chain (No. 16, Fig. 102)

The main drive chain 16, is adjusted by varying the distance between the engine and the main jackshaft. This is done by shifting the engine thru the use of adjusting bolts on the inner engine sill.

2. Pugmill Pinion Shaft Drive Chain (No. 17, Fig. 102)

Proper adjustment of this drive chain is maintained by a spring loaded idler sprocket. While in operation there should be no appreciable slack in this chain.

3. Elevator Bevel Gear Shaft Drive Chain (No. 18, Fig. 102)

This chain is adjusted with no slack when installed. If the chain becomes slack it is necessary to shim the conveyor drive shaft away from the conveyor bevel gear shaft.

4. Conveyor Drive Chain (No. 19, Fig. 102)

This chain is properly adjusted at all times by a weighted type idler sprocket.

5. Viking Pump Drive Chain (No. 20, Fig. 102)

The Viking Pump drive chain is adjusted by a movable sprocket idler running against the slack run of the chain.

6. Water Pump Countershaft Drive Chain (No. 21, Fig. 102)

The water pump countershaft drive chain is adjusted by a movable sprocket idler running against the slack run of the chain, similar to the Viking Pump drive chain.

7. Water Pump V-Belt (No. 22, Fig. 102)

The water pump V-belt is kept in proper adjustment by a spring loaded idler.

8. Kinney Pump Drive Chain (No. 23, Fig. 102)

The Kinney pump drive chain is kept in proper adjustment by a movable sprocket idler running against the slack run of the chain.

POWER UNIT

How To Remove

The engine and speed reducer are bolted rigidly to two engine sill angles. These sill angles in turn are bolted to the mixer frame by four hold-down bolts. The engine should always be left bolted to the sill angles unless it is absolutely necessary to remove.

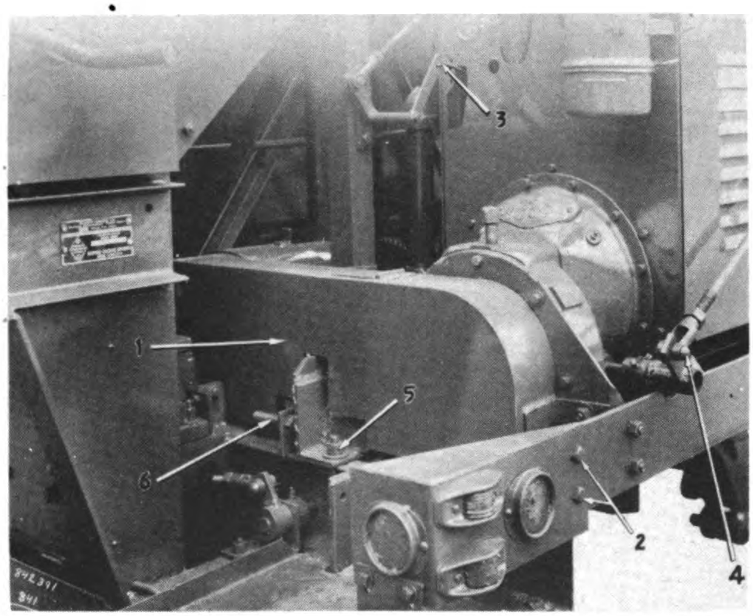


FIGURE 103

To remove the engine from the mixer, first remove the drive chain guard 1, Fig. 103 which is bolted to the engine speed reducer housing, a vertical frame angle and to another small guard in the interior of the machine. Break the engine drive chain then remove the bolts 2, which hold light and reflector bracket to the outer engine sill. Disconnect the throttle control 3, by removing the small cotter pin through the extension at the engine panel and disconnect the master clutch control lever by removing the cotter and pin 4, from the yoke on the long lever at the point where the lever connects to the shifter near the clutch housing.

Remove the four engine hold-down bolts 5, and the engine take-up adjusting bolts 6, which are fastened to the inner engine sill angle. This allows the engine to be lifted up and off from the machine. ~~This can~~ be easily done by passing chains under the engine to form a sort of a sling and then using a chain hoist to lift engine off.

To replace engine, reverse procedure making sure that engine sprocket and sprocket on the main jackshaft are lined up before tightening engine hold-down bolts and adjusting bolts.

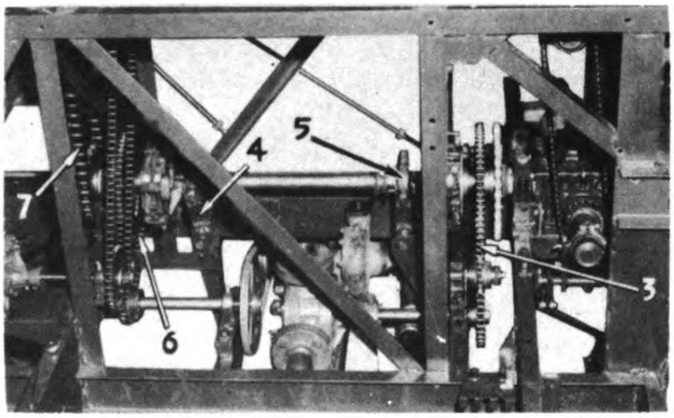


FIGURE 104

MAIN JACKSHAFT

How To Remove (No. 2, Fig. 102)

The main jackshaft must be removed to replace any of the bearings, clutches, gears or sprockets. It can be removed most easily by lifting out through the side of the frame just above the hoist platform in front of the engine speed reducer. Since it is a heavy shaft, it is advisable to support this shaft from above when removing, preferably with a chain hoist.

To remove the main jackshaft, first remove the drive chain guard 1, Fig. 103 which is bolted to the speed reducer housing, a vertical frame angle, and to a small guard on the frame of the machine 2, being held there by two bolts. Then disconnect and remove the engine drive chain; disconnect and remove the Viking pump drive chain 3, Fig. 104. Working from underneath the machine, remove the two clutch shifter linkages 4, and 5 so that shaft will be free when it is lifted up. Disconnect the water pump countershaft drive chain 6, Fig. 104A and at the end of the shaft remove the pugmill pinion drive chain 7; then remove the bearing hold-down bolts.

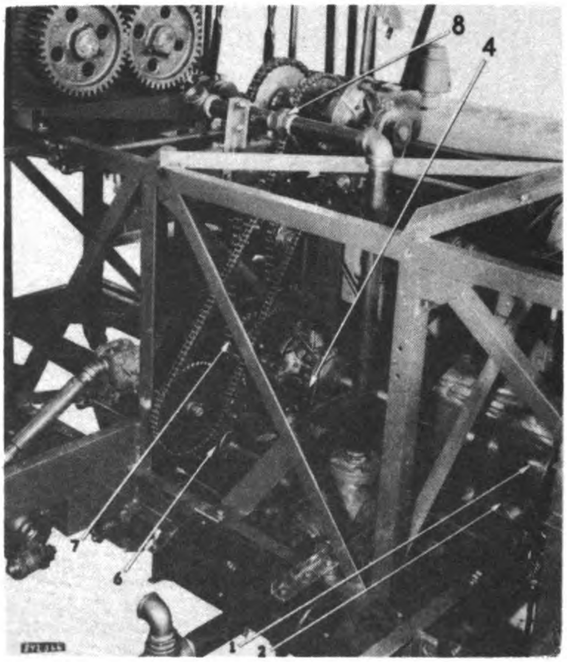


FIGURE 104A

Disconnect the Viking pump piping from the pump up to the storage tank at the union 8, near the pugmill pinion shaft. Remove the sections of pipe down to the pump to allow the jackshaft to be swung over so it can be pulled out from the frame at an angle.

Mixer Main Jack Shaft

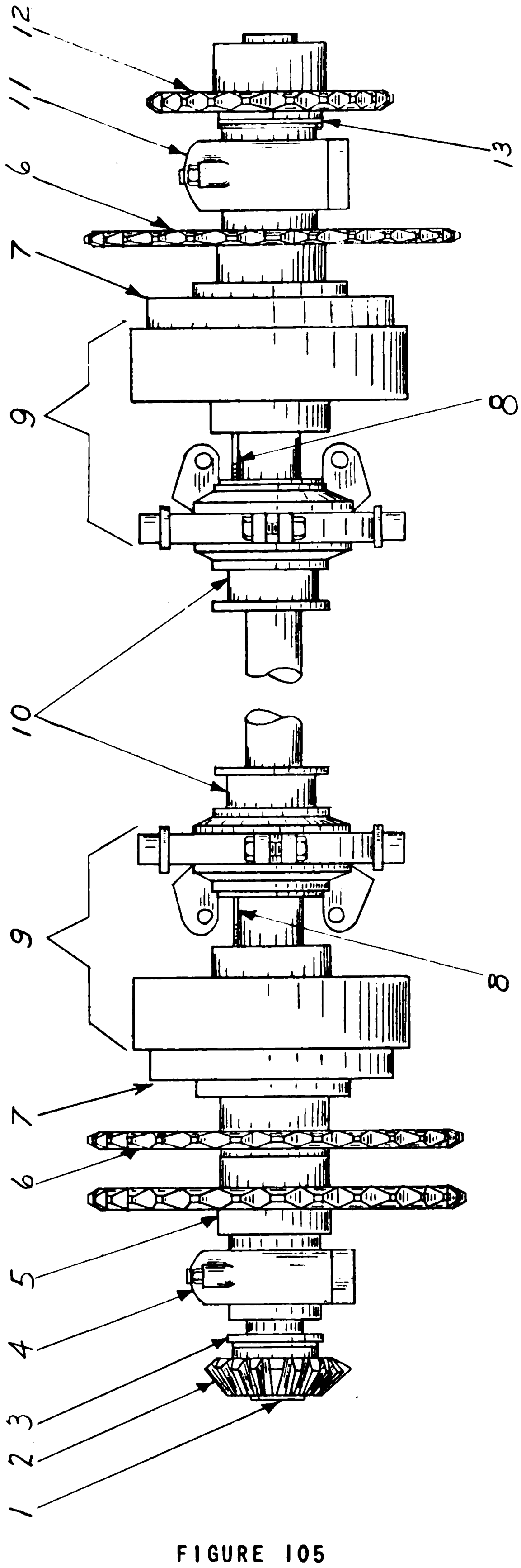


FIGURE 105

To free the bevel gears, first remove the small piece of the gear box housing which bolts over the jackshaft. Then when the jackshaft is loose, and the shims have been removed, shaft can be moved sideways enough to disengage the bevel gears so that the shaft can be lifted up enough to clear the top of the gear case.

Since the jackshaft is now free, connect it to the chain hoist above and swing the pugmill end of the jackshaft over and then pull the engine drive end out through the side of the frame to remove the jackshaft all the way.

To replace jackshaft, reverse procedure making sure that all sprockets line up before tightening hold-down bolts and adjusting shim bolts. It may be necessary to change the alignment of some of the other smaller shafts since the position of the main jackshaft is determined by the beveled gear which must be properly meshed with the bevel gear on the conveyor bevel gear drive shaft.

How To Strip Shaft

The main jackshaft must be removed to replace any items except the friction clutch bands or the pugmill pinion drive sprocket 12, Fig. 105.

Therefore, when the shaft is removed, to disassemble remove the keyed drive sprocket 12, remove the washers 13, remove the Dodge-Timken roller bearing 11, slide off the water pump countershaft sprocket 6, loosen the wired set screws in the clutch 9, slide off the complete clutch assembly, loosen the shifter set collar 10, and slide it off.

Then working from the bevel gear end remove the bevel gear 2, which is set screwed and keyed to the shaft. Remove the Dodge-Timken roller bearings 4, slide off the double sprocket 5 and 6, loosen the two wired set screws on the clutch 9, and slide off the clutch assembly. Finally remove the clutch set collar 10, which is set screwed on the shaft.

In reassembling the shaft, make sure that the set screws fit in the spots provided on the shaft. Tighten all set screws firmly and wire those which are provided with a drilled head to keep set screws tight.

For details of friction clutch, see under 8" Clutch in index.

PUGMILL PINION SHAFT

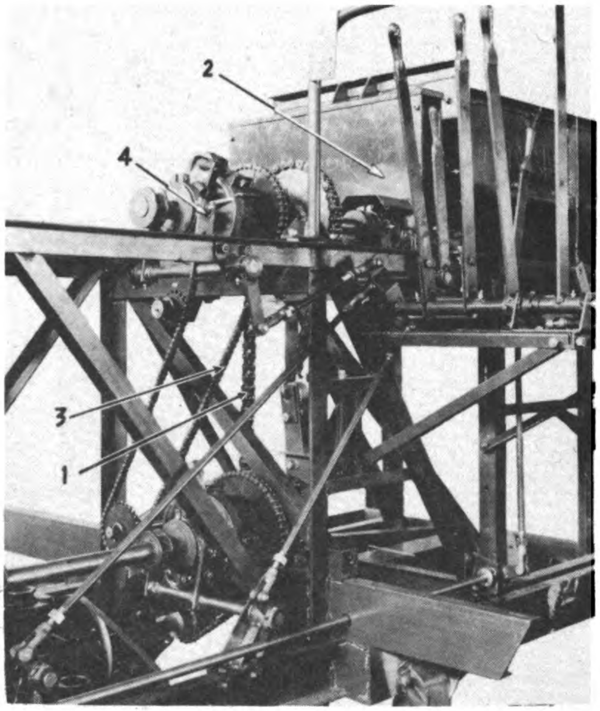


FIGURE 106

Pugmill Pinion Shaft

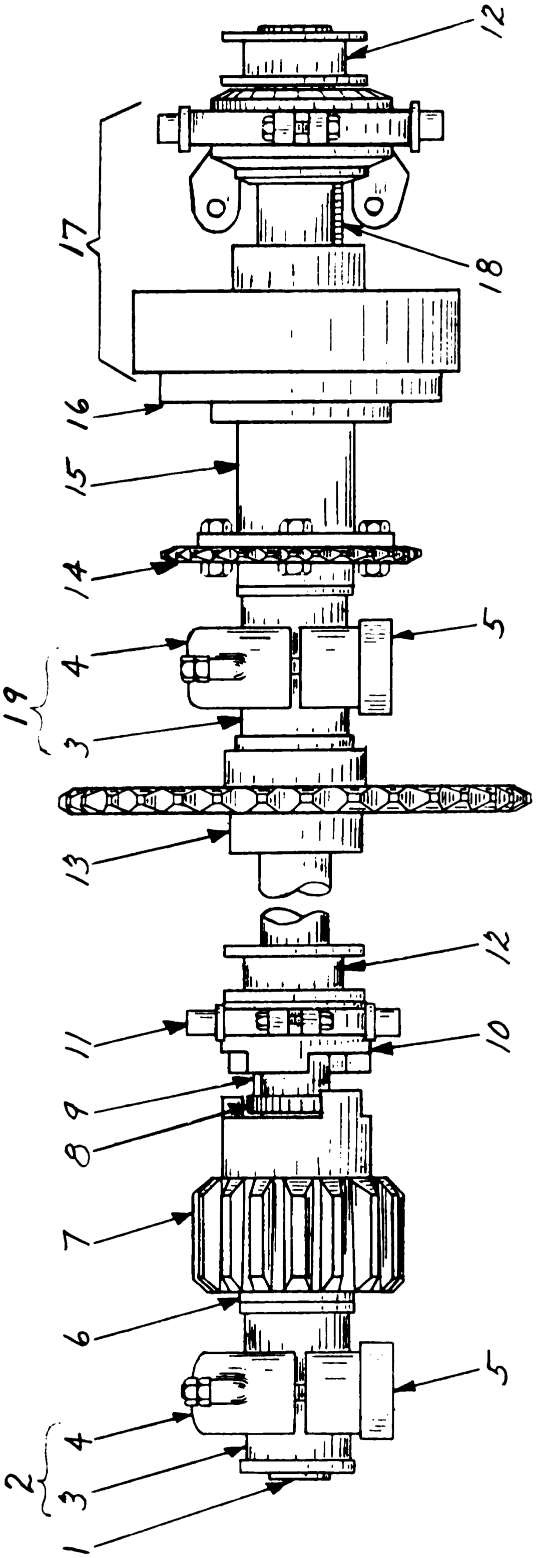


FIGURE 107

How To Remove (No. 3, Fig. 102)

The pugmill pinion shaft is driven by a chain 1, Fig. 106 from the main jackshaft and drives the pugmill gear by a pinion which is enclosed in an oil tight gear case 2. To remove this shaft, first remove the chain 1, from the main jackshaft, the Kinney pump chain 3, and then remove the guard and shifter linkage 4, on the friction clutch which drives the Kinney metering pump.

Then drain the pugmill gear case 2. Remove the side and ends of the pugmill gear case and then remove the bottom so that finally only the back metal plate and felt seal of the gear case remains behind the pugmill gears. Remove the grease piping from the bearings then remove the bearing hold-down bolts and the stop shim bolts and stop angles. The shaft assembly is now free and can be pulled out towards the operator's platform so that the pinion will be free from underneath the pugmill gear. Then by using a small hoist, the shaft can be lifted up and off the machine for repair.

To replace pugmill pinion shaft, first place shaft alongside position and then slide in under pugmill gears into position. Line up gears carefully and replace bearing hold-down bolts and stop bolt shims. Replace pugmill drive chain and Kinney pump chain. Reassemble the pugmill gear box and replace the bearing, grease piping and guard over the friction clutch and the linkage.

How To Strip Shaft

To replace the friction clutch 17, Fig. 107 shifter, Kinney drive sprocket 14, or the bearing 19, at that end of the shaft, it is not necessary to remove the shaft for replacement. However, to replace the drive sprocket 13, or the pinion gear 7, and bearing 2, it is necessary to remove the shaft in order to replace. In stripping the shaft remove the set collar 12, and loosen the wired set screws on the clutch carrier 17, then slide the complete clutch carrier and shifter assembly 17, off the end of the shaft, then remove the Kinney pump sprocket 14, remove the ball and socket bearing 19, remove the large drive sprocket 13, which is set screwed and keyed to the shaft, remove the set collar 12, and shifter yoke 11, the pinion set collar 8, remove the pinion 7, the metal gear box connection 6, and the felt seal and finally the other ball and socket bearing 2.

In reassembling these units on the shaft make sure that all set screws line up with spots provided on the shaft. For details of the friction clutch, see 8" Clutch in index.

CONVEYOR BEVEL GEAR COUNTERSHAFT (No. 6, Fig. 102)

How To Remove

The conveyor bevel gear countershaft is driven by a bevel gear on the end of the main jackshaft and drives the conveyor drive shaft through chain and sprockets. To remove the shaft, first break and remove the conveyor drive shaft chain. Then from underneath the machine disconnect the clutch shifter linkage so that the shaft, when lifted up, will be free.

Drain the bevel gear case and then remove the shaft covers which bolt to the inside of the gear case. Remove the bearing hold-down bolts and remove the shims and stop shims.

Now that the shaft is free, shift it back to free bevel gears, then lift up and out through frame in front of the engine drive.

To replace shaft reverse procedure making sure that the bevel gears are in proper mesh before tightening the bearings or trying to align the sprockets. Then tighten bearings, line up sprockets, replace chain and replace shifter linkage.

How To Strip Shaft

Because of the necessity of keeping bevel gears in proper mesh, replacement of practically any part on the shaft will require realigning the bevel gears, so the shaft might just as well be removed during replacing since it

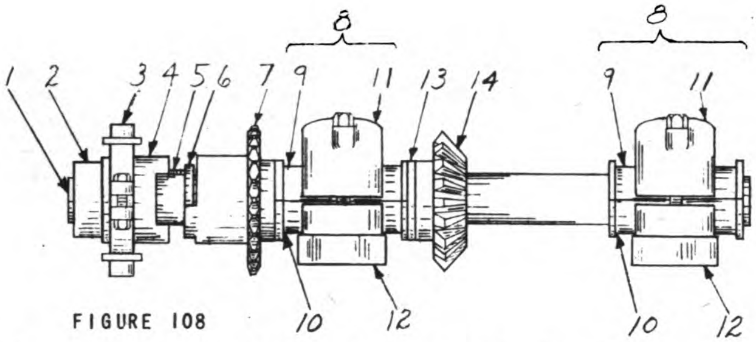


FIGURE 108

will simplify the job. Therefore, after removal the shaft may be stripped by removing set collar 2, Fig. 108, sliding off the shifter 3, removing the set collar 5, and key, sliding off the sprocket 7, removing the ball and socket bearing 8, and the brass thrust washer 13, and removing the keyed and set screwed bevel gear 14, and finally the other ball and socket bearing 8.

When reassembling this shaft, make sure that all set screws fit in the spots on the shaft, then replace the shaft on the machine.

CONVEYOR DRIVE SHAFT (No. 7, Fig. 102)

How To Remove

The conveyor drive shaft is chain driven from the conveyor bevel gear shaft and drives the two drive pulleys on the chief sections of the conveyor. To remove the shaft, first break and remove the two drive chains. Then by removing the bearing bolts the shaft is free to drop out.

To replace, reverse procedure making sure sprockets are aligned before replacing bearing bolts.

How To Strip Shaft

To replace any part on the shaft, it is probably most easy to remove the shaft for replacing, therefore, after the shaft has been removed, strip it down by removing the sprocket 6, Fig. 109, which is set screwed and keyed to the shaft, removing the bearings 2, then the set collar 7, which is keyed and set screwed to the shaft and the other sprocket 6, which is also set screwed and keyed to the shaft.

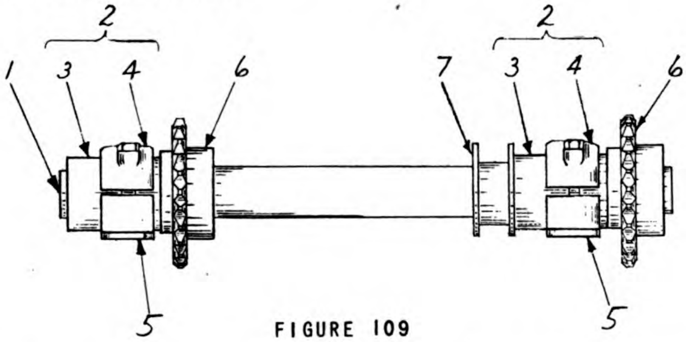


FIGURE 109

In replacing and reassembling, make sure that the set screws fit in the spots provided on the shaft.

KINNEY PUMP (No. 15, Fig. 102)

How To Remove

To remove the Kinney pump, first be sure all asphalt has been drained from the pipes, then disconnect the pipe leading from the pump to the pugmill

at the union and remove the pipe sections up to the pump. Likewise remove the pipe sections from the pump to the tank. Break the pump drive chain or loosen the idler so that the chain may be taken off the sprocket. Remove the outboard bearing hold-down bolts and remove the four pump hold-down bolts. The pump is now free and can be lifted out from the machine.

To replace the pump, reverse the procedure making sure to line up the pump sprocket with the driver sprocket on the pugmill pinion shaft and align the outboard bearings properly.

VIKING PUMP (No. 12, Fig. 102)

How To Remove

To remove Viking pump, disconnect the pipe supply line from mixer tank and remove the sections of pipe up to pump. Then disconnect the discharge pipe line and remove the sections of pipe down to the pump. Break the drive chain, remove the outboard bearing hold-down bolts. Remove the four pump hold-down bolts. The pump is now free of the machine and can be removed. To replace, reverse procedure making sure to line up pump sprocket with sprocket on main jackshaft before tightening hold-bolts. The pump sprocket 2, is fastened to a keyed hub 3, by a breaker bolt 4, which protects the pump from overloads.

CENTRIFUGAL WATER PUMP (No. 14, Fig. 102)

How To Remove

The centrifugal water pump is V belt driven. Therefore, to remove it, first release the spring idler roller so that the belt may be taken off. Then remove the guard over this belt which is bolted to the frame and then remove the belt from the pulley. Remove the four hold-down bolts which hold the pump solid to the bracket support. Remove the piping, both suction and discharge from the pump which now allows the pump to be removed for replacement.

To replace the pump, reverse the procedure, bolting the pump securely to foundation and making sure that the pulleys line up before replacing the piping and the belt and guard.

WATER PUMP COUNTERSHAFT (No. 13, Fig. 102)

How To Remove

The water pump countershaft is chain driven from the main jackshaft being controlled there by a friction clutch. It drives the water pump with a V belt. To remove this shaft for replacement, release the slack in the chain by removing the idler and then break the chain and remove. Remove the guard over the pulley which is bolted to the frame, then slacking up on the roller idler, remove this V belt. Bearing hold-down bolts can then be removed which will allow the shaft to be pulled out from below the machine for replacement.

To replace, reverse the procedure making sure sprockets line up before bolting down bearing hold-down bolts. Replace the chain in the correct adjustment for slack and replace guard.

How To Strip Shaft

The water pump countershaft is a simple assembly consisting of two Fafnir Lak type ball bearings 3, Fig. 110, and a sprocket 14, which is keyed and set screwed to the shaft and a pulley 2, which is also keyed and set screwed to the shaft. It is necessary to remove the shaft for replacement of these parts.

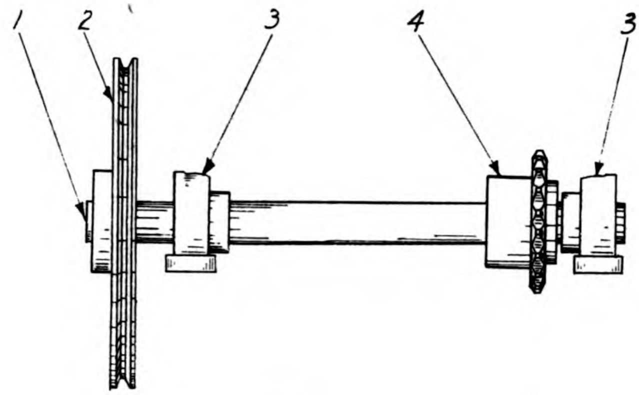


FIGURE 110

STORAGE TANK

How To Remove

To remove the storage tank from the machine disconnect the tank pipe outlet 1, Fig. 111, at the bottom, remove the supply piping 2, at the top of the tank and the return from the asphalt metering line on the inside. Disconnect the clearance lamp 3, on the forward end of the tank. Remove the four hold-down bolts 4, which hold the tank to the channel support. Remove the burner support which is bolted to the end of the tank. The tank is now free to be removed by lifting off with a hoist. To replace, reverse procedure

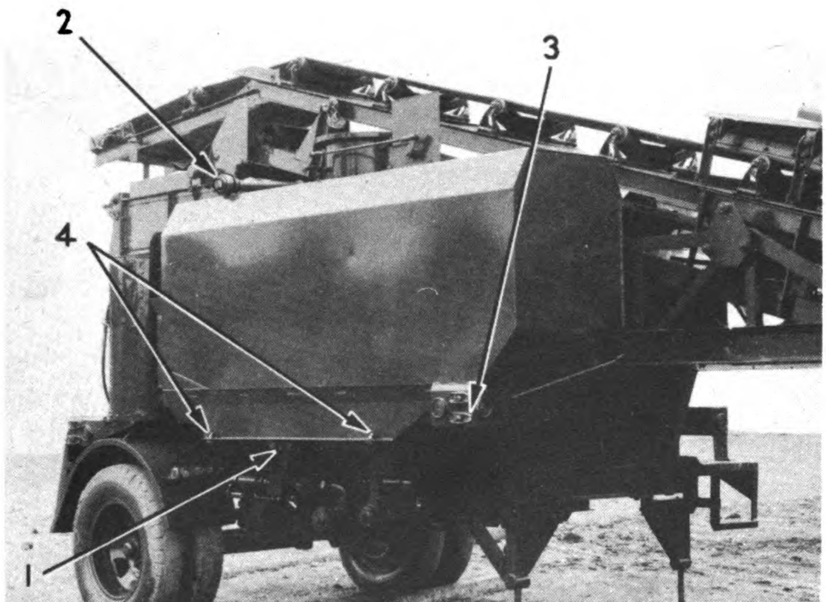


FIGURE 111

FORWARD BEARINGS AND GEARS ON PUGMILL SHAFTS

How To Remove

To remove pugmill gears and forward paddle shaft bearings, it is necessary to dismantle the pugmill gear case.

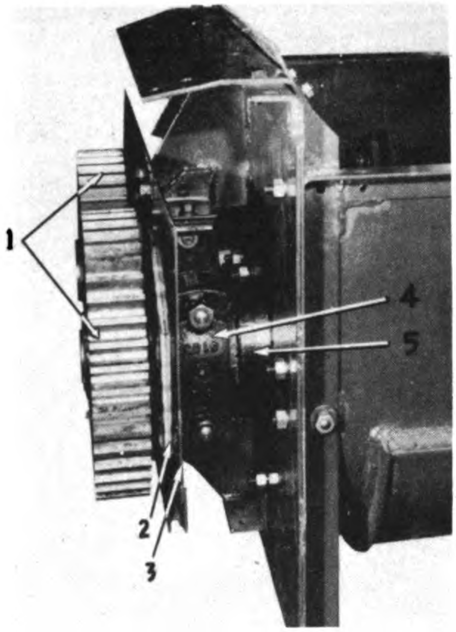


FIGURE 112

First, drain the case, then remove the sections of the case so that only the back plate is left on the shaft as shown in Fig. 112. Then loosen the pugmill pinion shaft bearing so that it can be shifted slightly so that the pugmill gears 1, can be pulled off. The gears 1, are set screwed and keyed to the shaft. CAUTION: Mark position of gears on the shaft so that when re-installed their position will be the same so that the relation of the pugmill paddle arms will remain unchanged.

After removing the gears, remove the felt oil seal 2, and remove the back gear case plate 3. Then remove the ball and socket bearings 4, from the shaft. After the bearings are removed, the seal 5, over the inner edge of the bearing can also be removed.

To replace, reverse procedure making sure set screws fit in spots provided on shaft.

CHANGING BOTTOM PUGMILL LINER PLATES

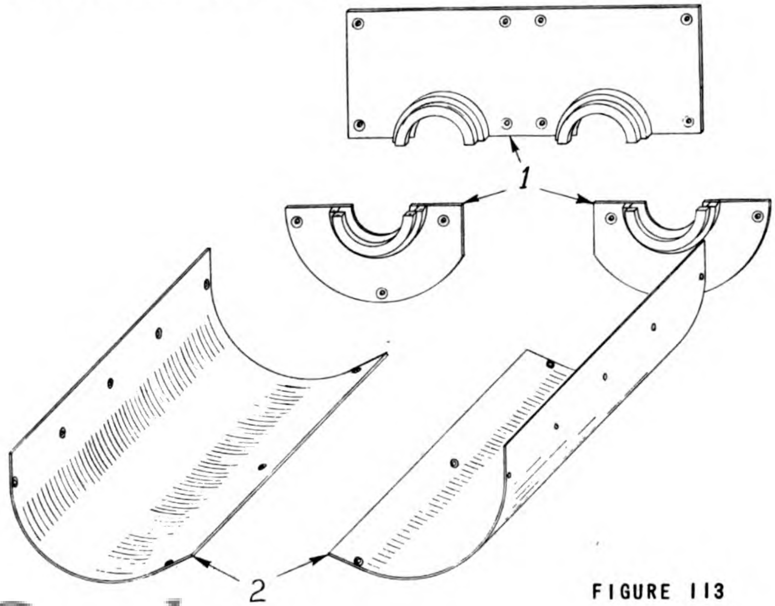


FIGURE 113

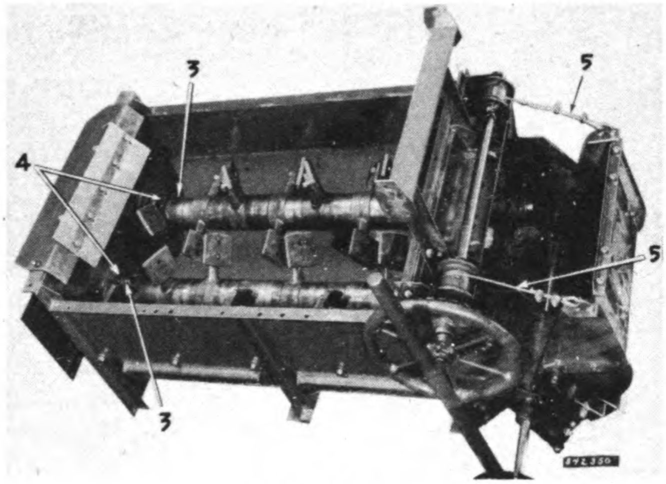


FIGURE 114

To replace, or to interchange the curved liner plates 2, Fig. 113, to get additional wear, proceed as follows:

Disconnect the discharge gate cables 5, Fig. 114, and remove the discharge gate. Scrape accumulated material away from liner plate to expose hold-down bolts.

Remove bolts from liner plate to replace or interchange. There are eight plow bolts in each plate, five along the outer edge which can be reached from either side of the machine and three which extend thru the inverted V section at the bottom of the pugmill and which can be reached from underneath. With bolts removed pry liner plate away from pugmill shell and pull the plate out from the discharge end of the pugmill.

When replacing plate, be sure that the liner plate hold-down bolts are fitted into the holes properly so that when the nuts are pulled down, the plow bolt heads will be flush with surface of the liner plates.

CHANGING END LINER PLATES

The end liner plates at the charging end of the pugmill do not require replacing as often as the curved liner sections. They should be checked periodically however, and replaced immediately when worn thru. The plates are made up in three sections; one extending above the center line of the paddle shaft completely across the pugmill, and two extending below the center line of the paddle shaft, one under each shaft. The plates are secured to the end of the pugmill by flat head plow bolts which extend thru the pugmill. These plates are usually replaced when the inner seals on the shaft need replacing or when the shaft is stripped. However, they can be replaced when shafts are assembled. To do so proceed as follows:

Unscrew the two adjusting seal ring screws 3, on each of the end paddles, this will allow the ring seals 4, to be moved back in order to get the plates out.

Remove the eight plow bolts from the upper liner section, pry upward on the section until the semi-circular section on the outer seal ring clears inner seal ring, then it can be removed.

Remove the 6 plow bolts from the two lower liner sections, pry the end of one section out so that it clears where it was flush against the other section. When cleared it can be rotated around the shaft so that it can be pulled out from the top. Remove the other section in the same manner.

Install the lower liner section first by fitting the groove in the semi-circular part of the section over the inner seal ring and rotate the section downward into place in the opposite direction of rotation of the paddle shaft. Install the upper section and take up on the seal ring adjusting screws so the ring fits firmly.

Pugmill Paddle Shafts

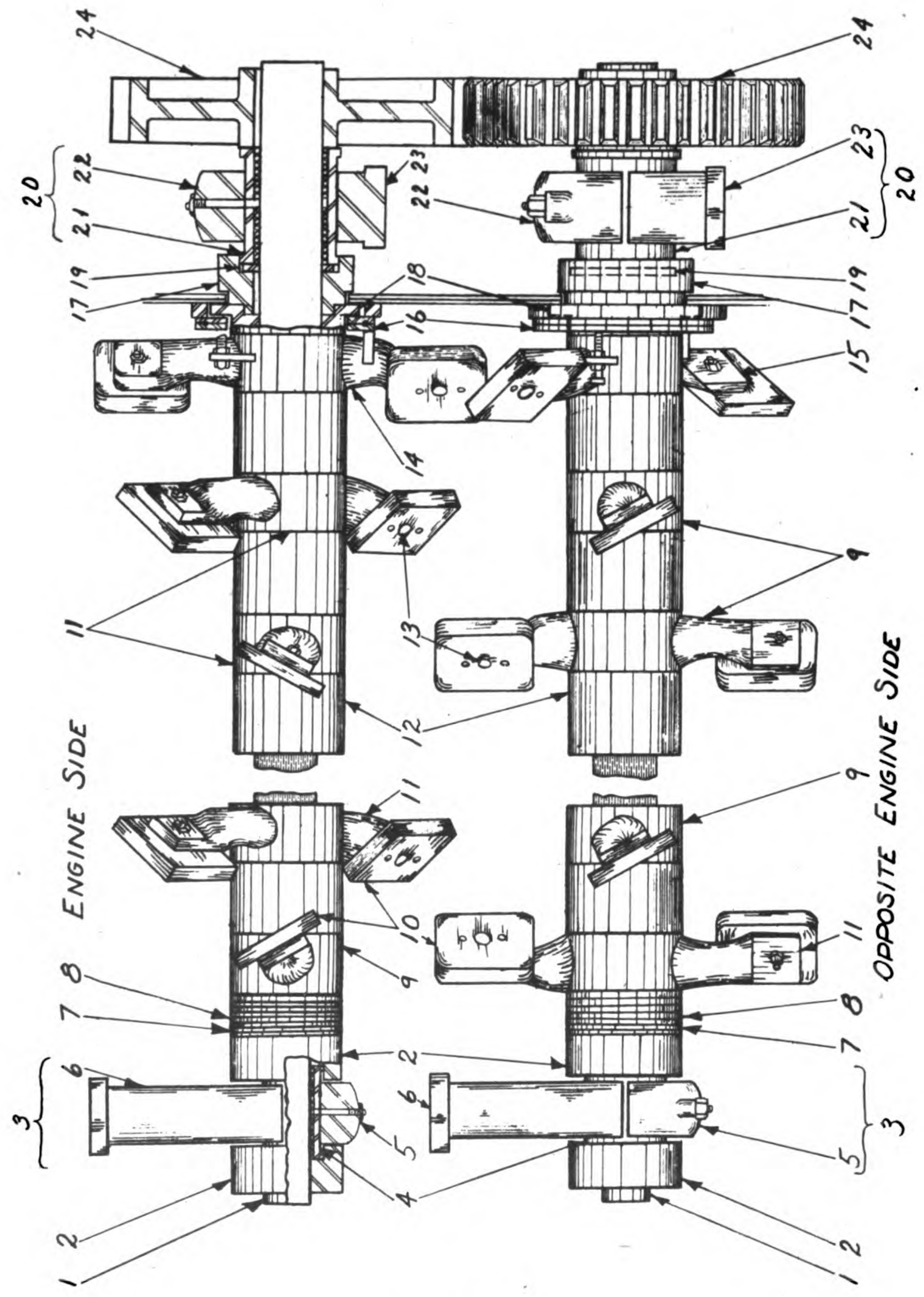


FIGURE 115

REPLACING PADDLE TIPS

Paddle tips are subject to high abrasive wear and should be checked daily for this reason. The paddle tip 10, Fig. 115, is secured to the end of the paddle arm by one flat head plow bolt 13. Should the outer edge of the paddle tip show considerable wear and the face of the tip is worn only slightly, the tip can be removed and turned end for end to obtain more service. When the paddle tip becomes badly worn, replace with a new one rather than expose the paddle arm to the abrasive action of the mix which is a much more difficult item to replace comparatively speaking.

CHANGING PUGMILL PADDLE ARMS

To replace worn pugmill paddle arm and to change the paddle setting of the pugmill, it is necessary to strip the shaft starting at the discharge end and working back towards the spray bar end until the desired paddle is reached.

To strip the shaft, it is first necessary to remove the entire discharge gate assembly.

It is then necessary to remove the end bearing 3, from the paddle shaft. Before doing so, support the weight of the shaft by placing a small block underneath one of the paddle arms which is in a vertical position.

Loosen the set screws in the outer bearing collar seals 2, on these two shafts and slide these seals off.

Remove both of the ball and socket bearing assemblies 3, by removing the four hold-down bolts which secure the bearing bases 6, to the support.

NOTE: Be sure to keep a check on the number and position of the shims under each bearing base and at the side so that they can be put back exactly as they were in order not to disturb the alignment of the pugmill gears 24, at the drive end of the shaft.

Remove the set screws from the inner bearing collar seals 2, and slide them off the shaft. If the same paddles are to be replaced as in the case of changing the paddle setting, an easy method of removing the arm is possible if two lengths of 2" pipe about 4' long are available. Then by slipping the pipes over the rounded end of the paddle shaft, and supporting them at the other end, the paddles can simply be slid off the square paddle shaft onto this round piece of pipe and then replaced without having to lift them up and down from the machine. To continue with the stripping of the shaft after the bearings and seals have been removed, remove the spacer washers 7 & 8, from the last paddle shaft, then proceed to remove the paddle arms 9 & 11, and spacers 12, from the shafts noting that each paddle arm must be in a horizontal position before it can be slid off the shaft. This will require rotating the paddle shaft as each paddle is removed.

If only the paddle setting is to be changed, simply remove the paddles up to the point where the change of setting is to begin. If the shaft is to be stripped, remove all the paddle arms and spacers up to the pugmill seal 18, which is the last part on the shaft which can be removed from this end. There are three parts 16, 17, 18, to this seal but only two parts 16, 18, can be removed from this end.

To replace paddles, reverse procedure using the diagram of the paddle setting as a guide. The first paddle 14, 15, at the spray bar end, is a special paddle with an adjusting bolt which bears against the seal. Replace the paddle and bases on the shaft, checking the timing of the paddle arms as they are put on the shaft.

When all the paddles have been slid back into position and the washers 7, are put in place, the face of the last washer with a square bore should be flush with the square end of the paddle shaft. Then replace the bearing collar seals and the bearings in the order they were removed. Replace the shims under the bearings in the exact position as before.

Replace the discharge control gate to complete operation.

NOTE: The last paddle on each shaft is known as a retard paddle. This is because the paddle tip is at right angles to the other paddle tips on the shaft.

To obtain this retarding setting, it is necessary to use a paddle from the other shaft for if a paddle on the same shaft were turned, the tip would be at right angles but the paddle arm would be in front of the tip instead of behind. Therefore, to retard a paddle it is necessary to interchange a paddle from each shaft. These retard paddles should always be set at 90° to the paddles adjacent to them.

PUGMILL ASSEMBLY

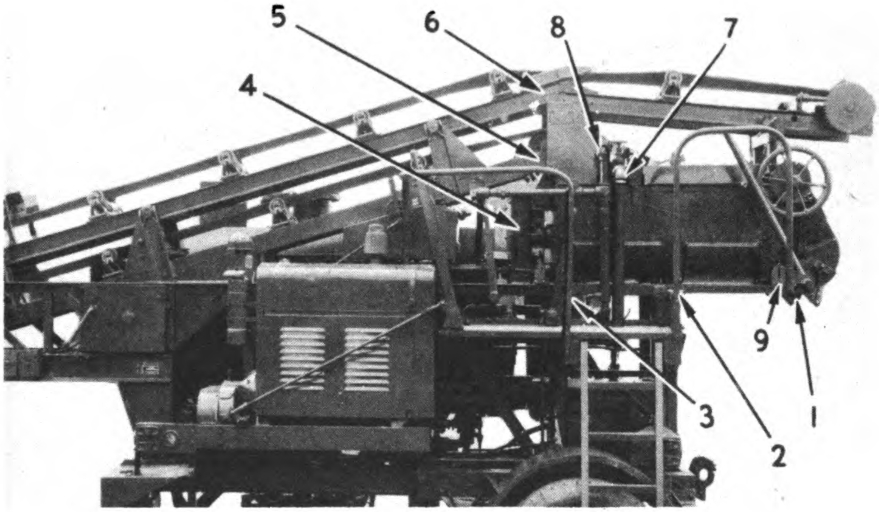


FIGURE 116

How To Remove

To remove the pugmill from the machine, first remove the conveyors 5 & 6, Fig. 116. Then disconnect the water 7, and asphalt piping 8, at the spray bars. Remove the cut-off gate lever extension bracket 9, which is bolted with four bolts to the operator's platform.

Drain the gear case 4, and remove the side which is bolted with seven bolts, the two ends which are bolted with six bolts and the bottom held on each side by four bolts. Loosen the pugmill pinion shaft bearing 10, and shift this shaft out slightly. Then remove the pugmill hold-down bolts which consist of six bolts 1, at the rear or discharge end of the machine, four underneath the middle of the pugmill 2, and four underneath the spray chamber of the pugmill 3. Then by attaching a chain around the pugmill, it can be lifted off with a hoist. To reassemble, reverse procedure.

PUGMILL DISCHARGE GATE

How To Remove

The pugmill discharge gate can be removed in assembled form from the rear of the pugmill. The gate assembly is fastened to the rear of the pugmill by eight machine bolts which hold the chute around the sides and bottom and four machine bolts which hold the top to the cross angle.

By removing these bolts, therefore, and at the same time removing the cable clamp connections to the pugmill discharge gate hoist, the assembly can be removed from the machine.

Disassembling The Discharge Gate

To dismantle the pugmill discharge gate, remove the chute cut-off gate rod linkages 1, Fig. 117. Then remove the pins and cotters 2, so that the cut-off can be removed from the chute end gate. Remove the bearing bracket 4, from the shaft by the lever arm. Remove the bolt 5, which connects the lever 10, to the quadrant 6. Remove the quadrant 6, which is keyed and set screwed to the shaft. Remove the shifter lever arm 7, which is also keyed and set screwed to the shaft.

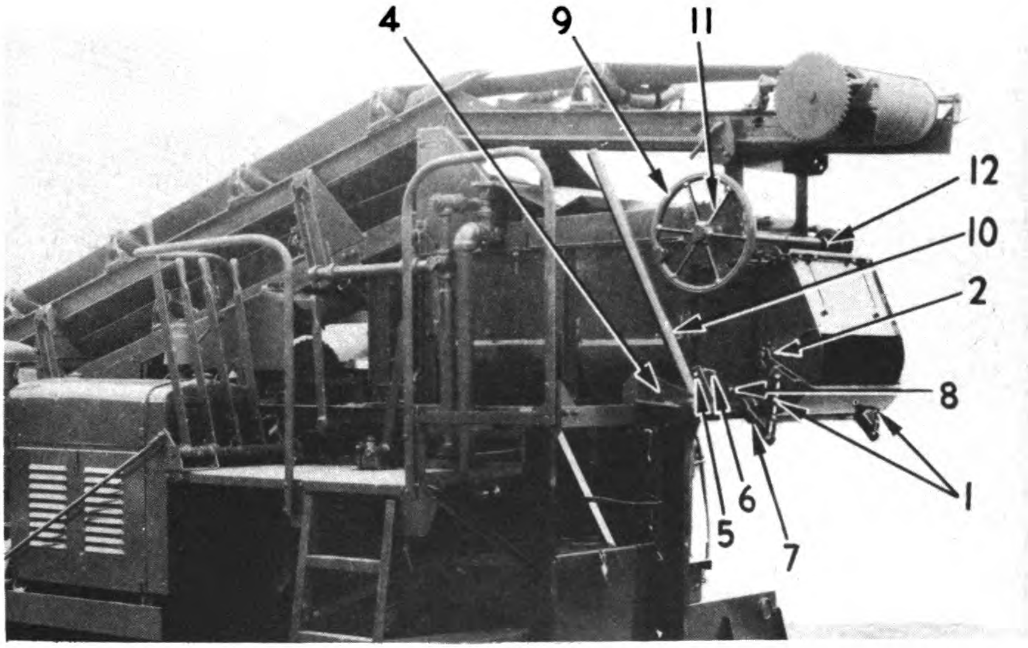


FIGURE 117

On each side at the bottom of the chute remove the two bearing brackets 8, which hold the end gate shaft in position, being held there by four bolts apiece.

PUGMILL DISCHARGE GATE HOIST

How To Remove

The pugmill discharge gate hoist is supported by bearing brackets which bolt through the rear of the pugmill. By removing the three bolts from each of these brackets and disconnecting the cables from the discharge gate, the hoist can be lifted from the machine.

Disassembling The Gate Hoist

Remove the gate hoist from machine, then loosen the Allen safety set screws on the hand wheel 9, and slide off shaft. Loosen the set screws in the ratchet 11, and slide it off shaft. Remove the bearing bracket, loosen the set screws in the two small cable drums 12, slide them off, remove the other bearing bracket. To reassemble, reverse procedure.

TRANSFER CONVEYORS

Telescoping Conveyor Assembly

The Telescoping Conveyor 1, Fig. 118, slides up and down over the fixed conveyor 2, section on support rollers 3, which roll on the conveyor frame channels 4.

To remove the telescoping conveyor from the machine, lower the telescoping conveyor to the ground using the hand hoist 5, then disconnect the hand hoist cables and slide the conveyor completely off the front end.

It is not necessary to remove the conveyor for replacement of the foot or headshaft or any of the telescoping conveyor carriers or the return idlers; also the belt can be replaced without removing the frame from the machine.

To remove the telescoping conveyor headshaft, loosen the belt by unscrewing the take-up bolts on the headshaft, remove these two adjusting take-up bolts from the bearings and the shaft can be lifted off the machine.

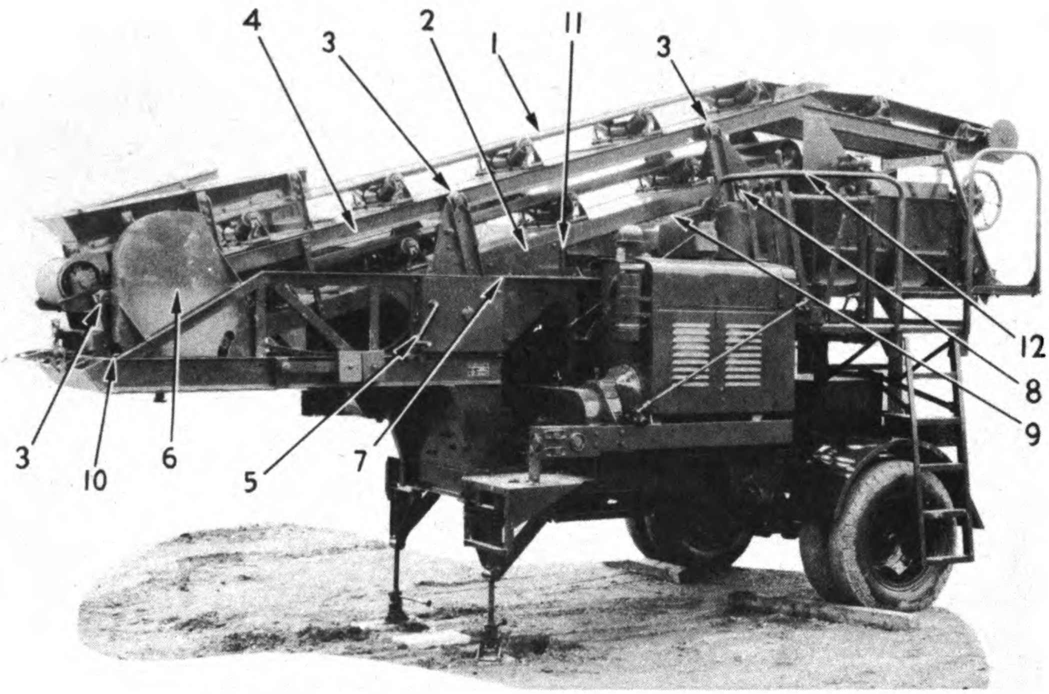


FIGURE 118

To replace any part on the shaft, remove from the machine, then remove sprocket 8, Fig. 119, which is keyed and set screwed to the shaft, slide off the two 2, 7 bearings, remove the set collars 3, loosen the pulley hub set screws, remove the bolts which hold the pulley 4, to the pulley hubs 6.

In reassembling shaft, do not tighten the bolts which connect the hubs to the pulley until the hubs have been tightened on the shaft.

To remove telescoping conveyor footshaft, remove bearing hold-down bolts, slack off on the belt so that the pulley can then be pulled out from the side.

To disassemble the footshaft, remove the bearings 1, Fig. 120, the inner set collars 5, loosen the set screws which hold the pulley hubs 6, to the shaft, remove the bolts which hold the pulley hubs 6, to the pulley 8.

In reassembling shaft, do not tighten the bolts which hold the pulley hub to the pulleys until the pulley hubs have been tightened on the shaft. To remove the return idlers, lower the conveyors so that the idlers may reach from the ground. Then remove the bolts which hold the bearings to the support angles.

The troughing carriers are fastened to the frame by one bolt at either end of the support frame. When re-mounting, be sure to align the carriers in order to keep the belt running true.

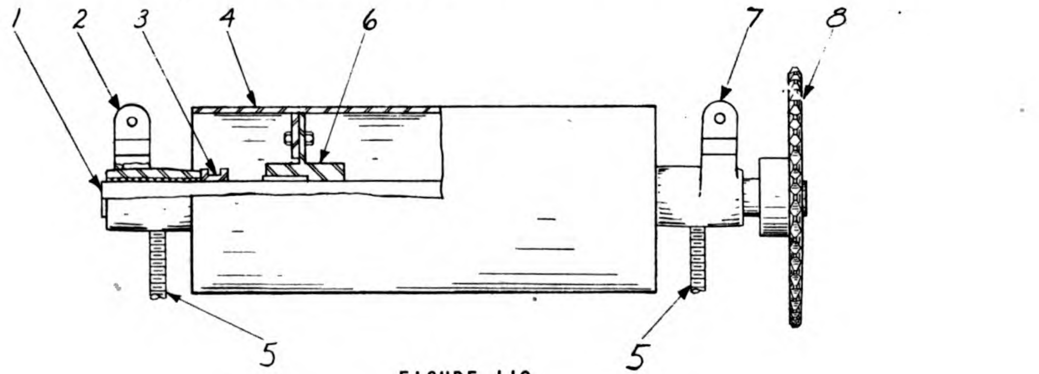


FIGURE 119

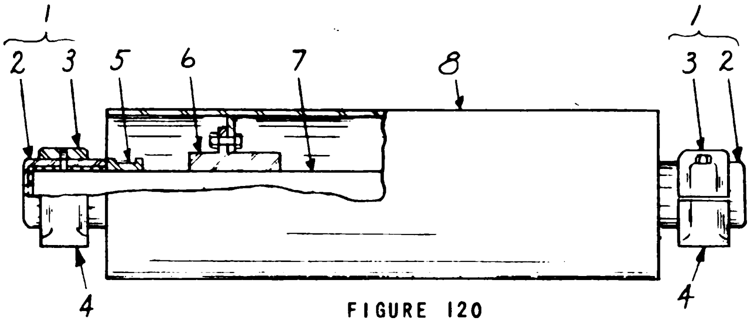


FIGURE 120

To replace the belt, slack up on the adjusting screws at the headshaft, remove the two pins from the alligator lacing, and remove the belt. When replacing with new belt, be sure to get the side with the trade mark up, since this side has a thicker rubber cover than the other and is known as the "carrying side".

TRANSFER CONVEYOR

Fixed Conveyor Assembly

To remove the fixed conveyor section 2, Fig. 118, first remove the telescoping conveyor section 1, from the machine. Remove the drive chain guard 6, which is bolted to the side of the mixer frame by three bolts. Remove the small guard 7, over the top of the hand hoist which is bolted to the frame with four bolts. Above the pugmill pinion shaft remove the small bracket 8, which supports some of the asphalt piping. Underneath the frame at that point remove the guard 9, which extends over the pugmill pinion shaft and is bolted to the under side of the frame. Then remove the two bolts which hold the fixed conveyor frame 10, to the front end of the mixer. Remove the two bolts which hold the frame to a stiffener 11, approximately at the middle of the frame; remove the two bolts 12, which hold the conveyor end to the pugmill. The conveyor is now free of the machine and can be lifted off with a crane or hoist.

To replace, reverse procedure.

It is not necessary to remove the fixed conveyor section to replace the pulleys or carriers or belt.

To remove the foot pulley, slack up on the adjusting screws and disconnect the belt by removing the pins from the alligator type lacing. Remove the drive chain guard 6, and the adjusting screw stop blocks. Then remove the adjusting screws from the bearings so that the pulley shaft can be removed from the machine.

To strip this shaft, remove the sprocket 8, Fig. 119, which is keyed and set screwed to the shaft, remove the bearings 2 & 7, on both ends, remove the inner set collars 3, loosen the set screws which hold the pulley hubs 6, to the shaft, remove the bolts which hold the hubs 6, to the pulley 4. To reassemble, reverse procedure, first tightening the pulley hubs on the shaft before tightening the pulley to the hubs.

To remove the headshaft, slack up on the belt, then remove the four bearing hold-down bolts and pull the headshaft off from the side.

To strip the shaft, slide off the bearings 2, Fig. 121, remove the inner set collars 3, loosen the pulley hub set screws, remove the pulley 5, from the hubs 4. To reassemble, reverse procedure first tightening the pulley hub to the shaft before tightening the pulley to the hub. The carriers and return rollers are replaced as described in the Telescoping Conveyor Section.

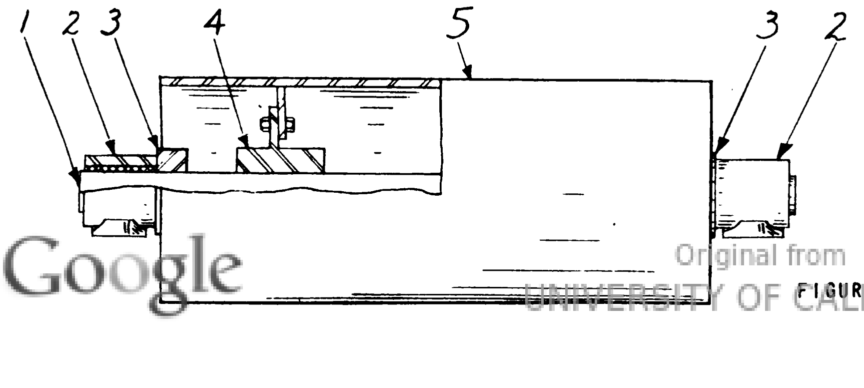


FIGURE 121

831 Trailer Mounted Bucket Elevator

Power Transmission Chart

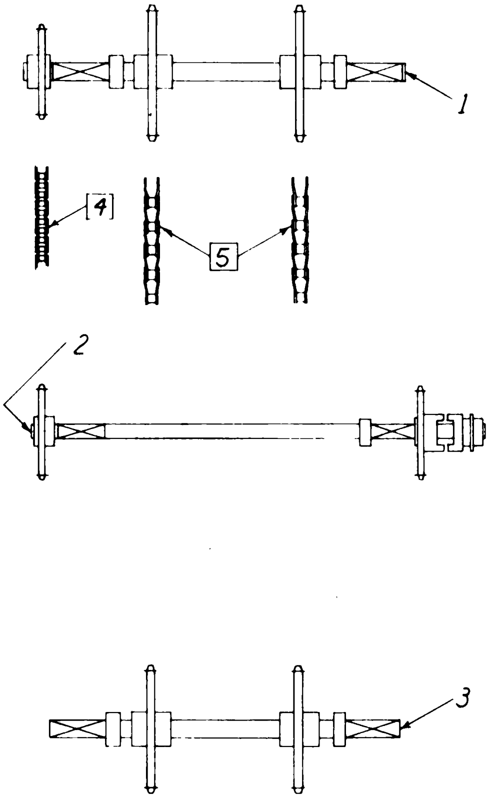


FIGURE 122

Shafting Identification & Speeds

	RPM	RPM
1 - Elevator Head Shaft	48.6	46.4
2 - Elevator Countershaft	48.6	46.4
3 - Elevator Foot Shaft	48.6	46.4
	When used with 831 Dryer	When used with 821 Soil Preparation Unit

Drive Chain Identification

$\boxed{4}$ - Head Shaft Drive Chain

$\boxed{5}$ - Elevator Bucket Line Chains

Head Shaft Drive Chain (No. 4, Fig. 122)

The head shaft drive chain is adjusted by a bolted sprocket idler running against the slack run of the chain.

Elevator Bucket Line

The twin elevator bucket lines are adjusted for proper slack by moving the headshaft by means of the two threaded adjusting screws which bear against the shaft bearings.

The two chains are of the offset type of steel bushed roller chain with special bucket attachment links every fifth link. The buckets are attached to these links by two machine bolts thru the back of the buckets.

ELEVATOR HEADSHAFT (No. 1, Fig. 122)

How To Remove

To remove the elevator headshaft 1, Fig. 123, first turn the bucket line around until one of the cotter pin connecting links is at the head-shaft; then remove this cotter pin link to break the bucket lines.

Slack up on the elevator headshaft drive chain 2, and remove this chain.

Remove the threaded adjusting screws 3, from the bearing, then slide the complete shaft forward and lift off the machine.

FIGURE 123

To replace elevator headshaft, reverse procedure making sure that the drive sprockets line up and that the bucket lines have the proper slack.

How To Strip Shaft

To replace any part on the elevator headshaft, first remove the head-shaft. Then remove the drive sprocket 1, Fig. 124, which is set screwed and keyed to the shaft. Remove the two bearings 2, which are free on the shaft; remove the set collar 3, remove the bucket line sprockets 4, which are keyed and set screwed to the shaft.

To reassemble shaft, reverse procedure making sure that set screws fit in spots provided on the shaft.

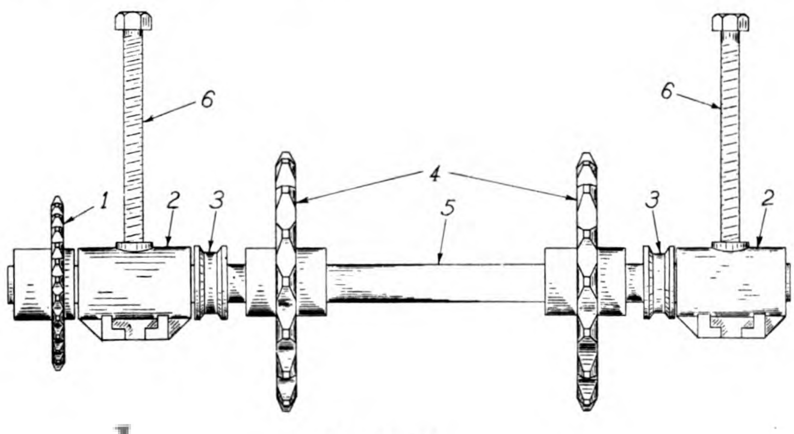


FIGURE 124

ELEVATOR FOOTSHAFT (No. 3, Fig. 122)

How To Remove

To remove the elevator footshaft on the machine, first turn the bucket lines around until the cotter pin connecting links are on the foot sprocket. Remove the cotter pin and break the bucket lines. Remove the elevator boot divider plate 4, Fig. 123, which is bolted to the boot casing.

Remove the bearing hold-down bolts so that the shaft can be lifted off the machine.

To replace shaft, reverse procedure.

How To Strip Shaft

The bearings may be replaced without removing the shaft from the machine. However, to replace sprocket it is necessary to remove shaft.

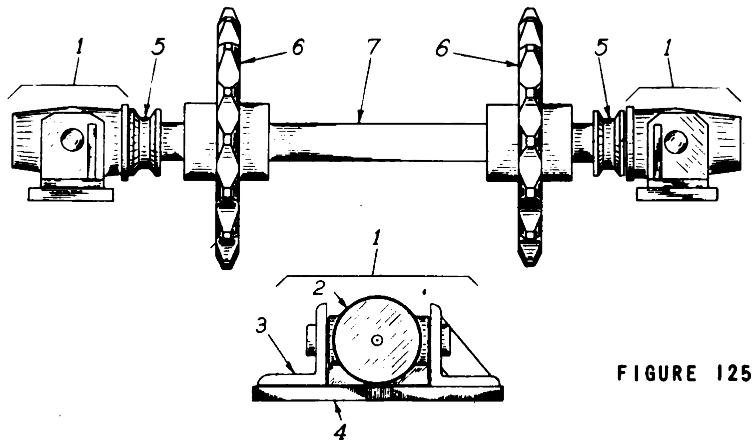


FIGURE 125

To remove bearing base 3 & 4, Fig. 125, from bearing, remove countersunk bolt which holds the two parts of the bearing base together, then slide bearing 2, off shaft and remove set collar 5, remove sprocket 6, which is keyed and set screwed to the shaft. Repeat procedure for other half of the shaft.

To reassemble footshaft, reverse procedure making sure set screws fit in spots provided on shaft and that bearings are bolted onto frame in proper alignment.

ELEVATOR COUNTERSHAFT (No. 2, Fig. 122)

How To Remove

To remove elevator countershaft, first remove the drive chain. Remove the two bolts which hold the shifter levers together so that one-half may be removed from the shifter yoke on the shaft. Remove the bearing hold-down bolts so that the shaft can be then removed from the machine.

To replace shaft, reverse procedure lining up sprockets before bolting down hold-down bolts.

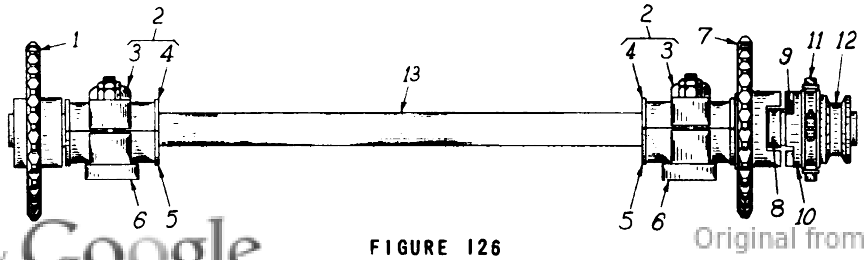


FIGURE 126

How To Strip Shaft

The sprockets and bearings may be replaced without removing shaft. To strip shaft, remove clutch shifter set collar 12, Fig. 126, slide off shifter 11, remove sprocket set collar 8, remove key, slide off sprocket 7, remove ball and socket bearing 2. At other end of shaft remove the sprocket 1, which is keyed and set screwed to the shaft, remove the ball and socket bearing 2.

In reassembling shaft, make sure that set screws fit in spots provided in shaft and make sure that jaw shifter engages properly.

BUCKET LINE IDLERS

How To Remove

The two bucket line idler assemblies are identical. To remove, unscrew nuts from the two U bolts 4, Fig. 127, which clamp the shaft to the support bracket. The idler shaft can then be removed from the machine.

To replace idlers, reverse procedure making sure roller fits under bucket line chain.

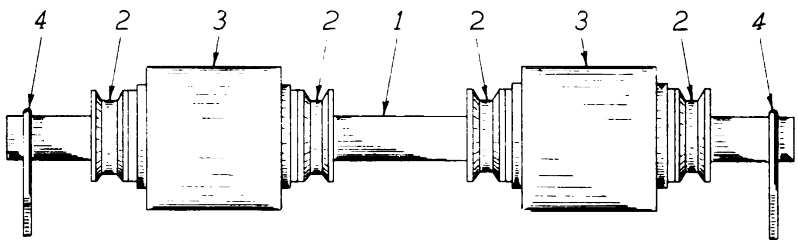


FIGURE 127

How To Strip Shaft

To replace bucket line idler, first remove from the machine. Remove set collar 2, Fig. 127, slide off rollers 3, remove inner set collars 2.

To reassemble, reverse procedure.

ELEVATOR CABLE HAND HOIST

How To Remove

The elevator hand hoist is a reduction gear hand hoist which is used to raise the elevator into operating position. To remove hoist assembly, remove cable drum shaft bearing 10, Fig. 128, hold-down bolts, remove bolts through gear casing 4, which fasten to the elevator frame. The hand hoist assembly can then be removed from the machine. To reassemble, reverse procedure.

How To Disassemble Hoist

Remove hand wheel 1, Fig. 128, which is keyed and set screwed to the shaft. Remove grease piping from hand wheel shaft and also from drum shaft on outside of gear casing. Remove cotter from pin 6, through middle of casing, pull pin out which will allow gear 5, to drop out. Remove the six bolts which hold the side of the casing to the rest of the housing. Slide this housing off, remove gear 7, on drum shaft which will allow drum shaft to be pulled out from housing. Remove set collar 8, remove bearing 10, on end of shaft. To reassemble unit, reverse procedure making sure that pinions and gear are in proper mesh and alignment before tightening set screws.

Elevator Cable Hand Hoist

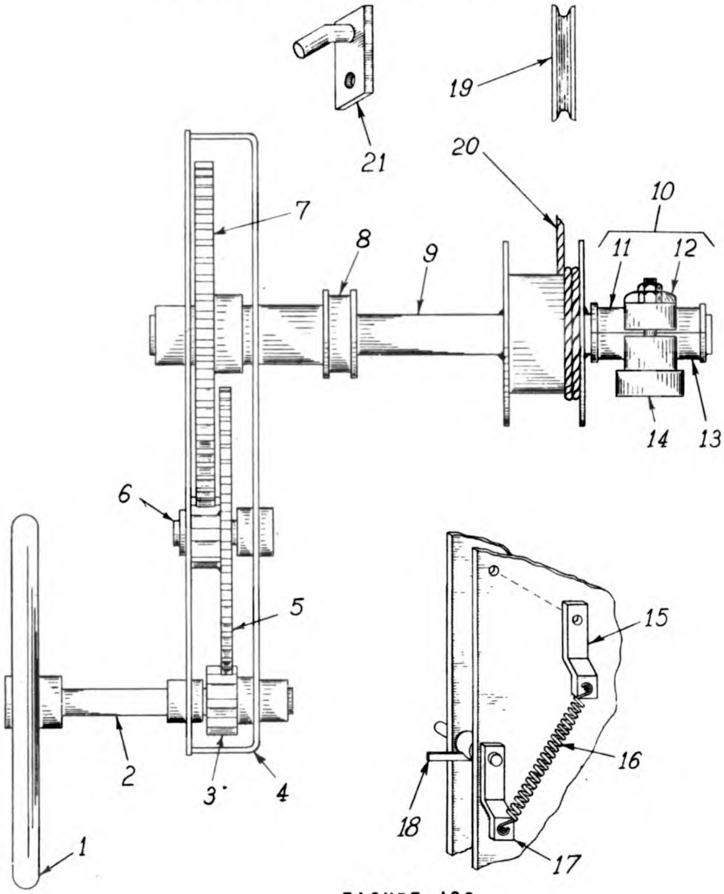


FIGURE 128

ELEVATOR DRAG SCOOP SHEAVES

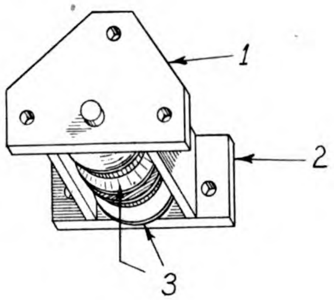


FIGURE 129

How To Remove

The two similar elevator sheave assemblies are at each end of an angle over the top of the boot divider plate. To remove the sheaves, remove the two long bolts on the end of this angle which clamp the keeper 2, Fig. 129, up to the small plate 1, on top. Drop this keeper out which will allow the sheaves 3, and washers to fall out. To remove the pin, remove the other bolt so it can be lifted off. To reassemble, reverse procedure.

831 Dryer Unit

831 Power Transmission Chart

Shafting Identification & Speeds

		RPM
	Engine	1400
1	- Reducer Take-Off	357
2	- Main Jackshaft	94
3	- Intermediate Jackshaft	94
4	- Dragline Shaft	70.5
5	- Dragline Shaft	70.5
6	- Feeder Crankshaft	48.6
7	- Drum	15.04
8	- Fan & Blower Jackshaft	580.3
9	- Fan Shaft	938.8
10	- Blower Shaft	679.0

Drive Chain and Belt Identification

11 - Main Jackshaft Drive Chain
12 - Dragline Drive Shaft Chain
13 - Dragline Drive Chain
14 - Feeder Crankshaft Drive Chain
15 - Drum Drive Chain
16 - Fan & Blower Jackshaft Drive Chain
17 - Fan Drive "V" Belt
18 - Blower Drive "V" Belt
19 - Elevator Drive Chain

Drive Chain and Belt Adjustment

1. Main Jackshaft and Fan Blower Jackshaft Drive Chains (Nos. 11 and 16, Fig. 130)

The two main drive chains are adjusted together by varying the distance between shaft and the engine by shifting the position of the engine through the use of adjusting bolts which are fastened to the inner engine sill.

2. Drum Drive Chain (No. 15, Fig. 130)

Proper adjustment of the drum drive chain is maintained by a spring loaded idler sprocket.

3. Intermediate Jackshaft To Dragline Shaft Drive Chain (No. 12, Fig. 130)

This chain is adjusted with no slack when installed. If the chain becomes slack, it is necessary to shim the dragline shaft away from the bevel gear shaft by inserting shims between the bearings and the stop angles.

4. Dragline Shaft Drive Chain (No. 13, Fig. 130)

The chain between the two dragline shafts is installed with no slack. Since it is a very short chain, it will possibly never need adjusting except if one of the shafts position is shifted. In this case it will be necessary to shim the driven dragline shaft away by inserting shims between the bearings and the stop angles or removing a half link from the chain.

5. Feeder Crankshaft Drive Chain (No. 14, Fig. 130)

The feeder crankshaft drive chain is adjusted with no slack when installed. If the chain should become slack during operation, it is necessary to shim the feeder crankshaft away from the drive shaft by inserting shims between the bearings and the stop angles.

831 Power Transmission Chart

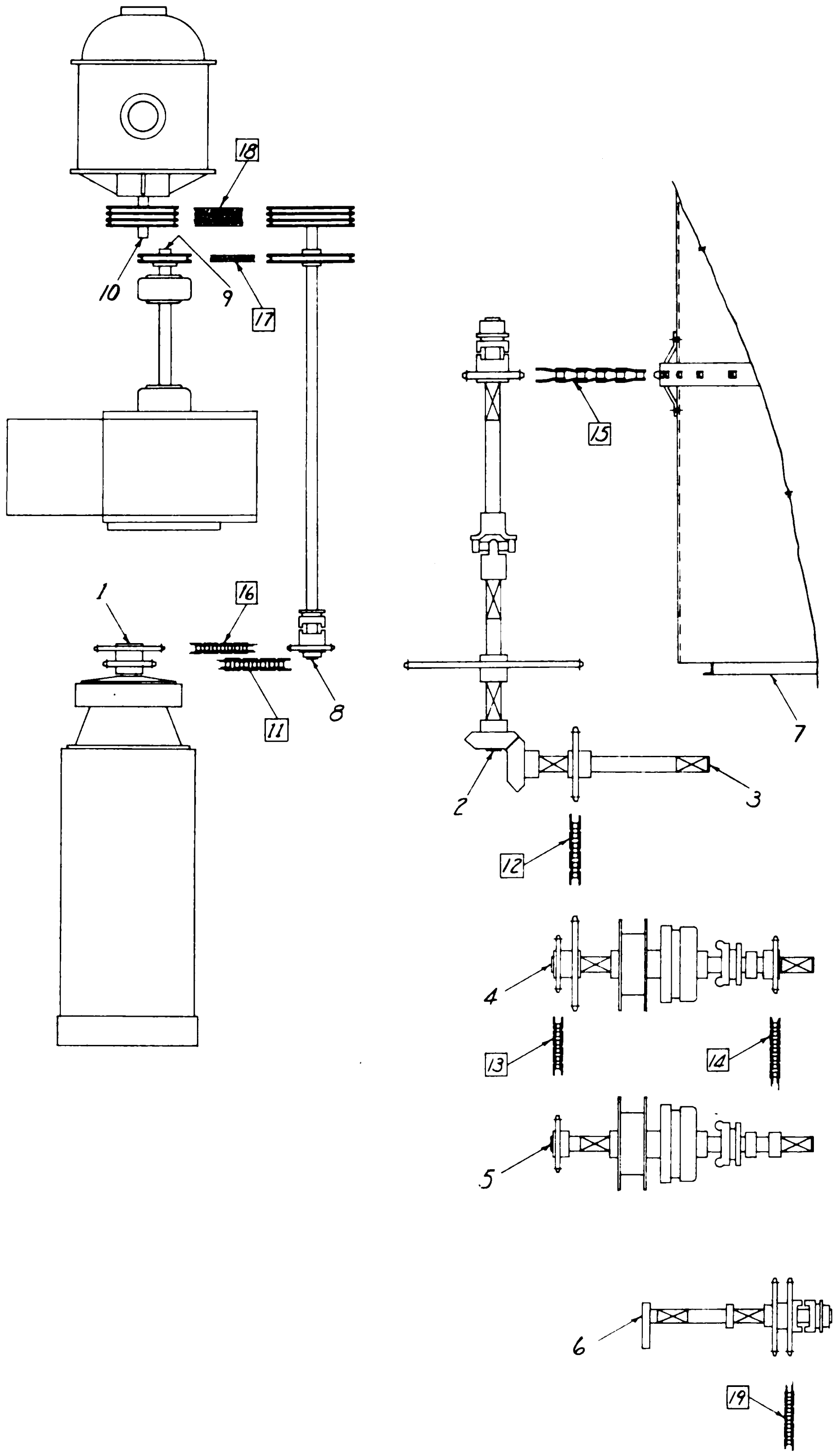


FIGURE 130

6. Exhauster Fan V-Belt (No. 17, Fig. 130)

The exhauster fan V belt is kept at proper tension by a spring loaded roller bearing idler.

7. Blower V Belt (No. 18, Fig. 130)

The three V belts which drive the blower are installed with proper adjustment. If they should become slack during operations so that slipping results, it is necessary to loosen the blower hold-down bolts and shift the position of the blower until the belts are tight.

Elevator Counter Shaft Drive Chain (No. 19, Fig. 130)

The elevator counter shaft chain is the powered take-off chain which drives the 831 Trailer Mounted Bucket Elevator from the dryer. This chain is kept at proper slack at all times by a weighted type idler sprocket fastened to the 831 Bucket Elevator frame.

POWER UNIT

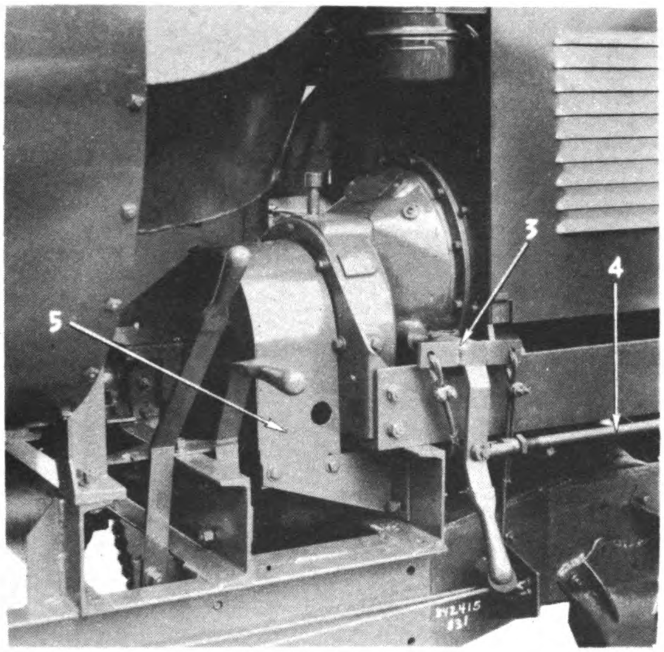


FIGURE 131

How To Remove

The engine and the speed reducer Fig. 131, are bolted rigidly to two engine sill angles. The sill angles in turn are bolted to the dryer frame by four hold-down bolts. The engine should always be left bolted to the sill angles unless it is absolutely necessary to remove.

To remove the engine from the dryer, remove the master clutch lever 3, Fig. 131, which is keyed and set screwed to the shaft on the clutch belt housing, and remove the remote control clutch lever 4, which is fastened under the sill angle at the forward end of the engine. Remove the main drive chain guard 5, which is bolted front and rear; remove the two drive chains.

Remove the four engine sill hold-down bolts Fig. 131A, and the engine take-up adjusting bolts which are fastened to the inner sill angle. The engine is now free to be lifted up and off from the machine which can be easily done by passing chains under the engine sill angles to form a sort of sling and then using a chain hoist to lift the engine off.

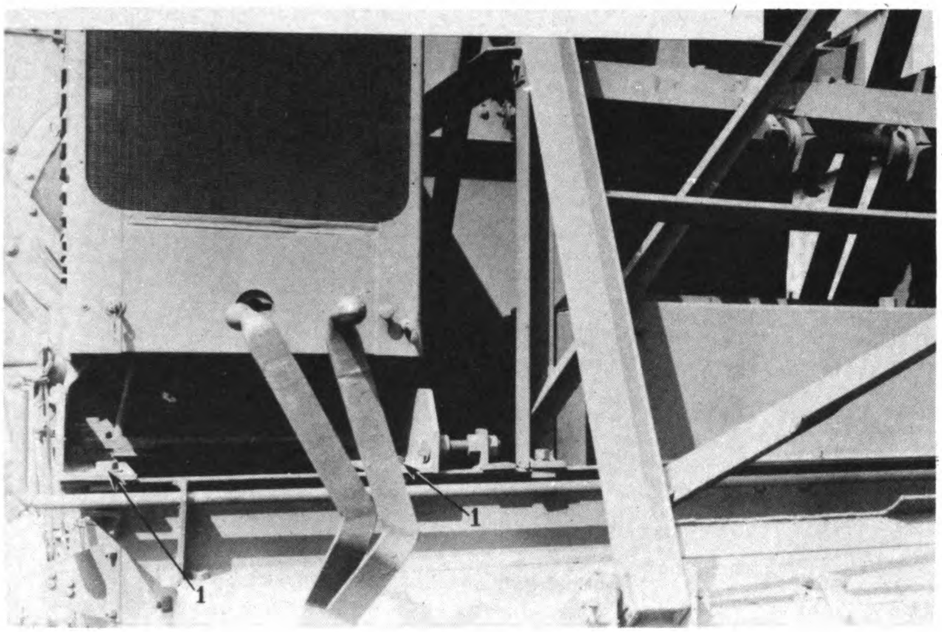


FIGURE 131A

To replace engine, reverse the procedure making sure that the engine sprocket and sprockets on the main jackshaft and the fan and blower jackshaft line up before tightening the engine hold-down bolts and the adjusting bolts. Replace drive chain guard and master clutch control linkage.

How To Disassemble

See Engine in Accessory Section.

MAIN JACKSHAFT (No. 2, Fig. 130)

How To Remove

The main jackshaft is driven by a chain from the engine and drives the drum and the intermediate jackshaft.

Remove drive chain guard from engine, break the drive chain and then break the drum drive chain.

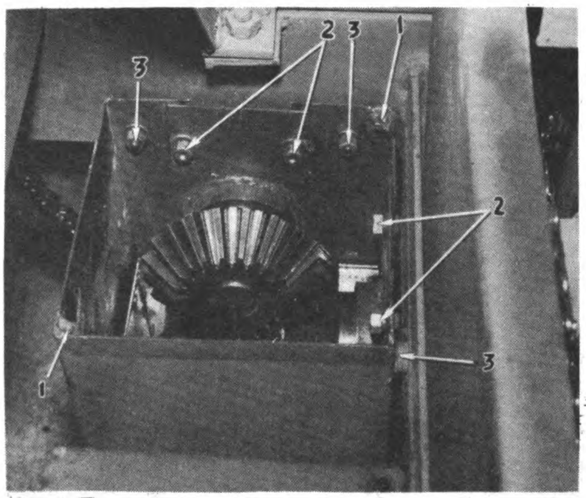


FIGURE 132

Remove all grease piping from bearings and remove the jaw clutch lever linkage at the drum drive end. Drain the bevel gear box lubricant by removing the pipe plug in the bottom. Remove the gear box cover held by two cap screws 1, Fig. 132 and remove the two gear box shaft cover plates which are held to the gear case by two bolts 2. Finally remove the gear case bolts 3, allowing the case to be taken out from below.

Support shaft from above then remove the bearing cap nuts which allow the shaft to be freed so it can be removed from below. When removing the shaft it is necessary to disengage the bevel gears which can be done by loosening bearings and shifting sidewise and then down.

If necessary to move the bearing bases note the amount of shims at each bearing for replacement, then remove the bearing base hold-down bolts and proceed as before.

Stripping Drum Drive End of Shaft

To replace parts on the drum drive end of the main jackshaft it is not necessary to remove the shaft.

Loosen the wired set screw in the collar 1, Fig. 133 and slide it off. Remove the drum jaw clutch lever linkage, slide jaw clutch shifter 2, off. Loosen the Allen type set screws in the collar 5, slide off, and remove the feather key. Release tension in the drum drive chain by releasing the adjusting nuts on the spring idler so that the drum drive sprocket 6, can be slid off the shaft. If there is not sufficient slack in this chain it may be necessary to break it. Remove the grease piping from the bearing 7, and then remove this ball and socket type bearing. The shaft is now stripped up to the universal joint 12, to remove the universal loosen the Allen type set screws so that it can be pulled off the shaft.

To reassemble the main jackshaft reverse the procedure making sure set screws fit in the spots provided on the shaft.

Stripping Bevel Gear End of Shaft

To replace parts on the bevel gear end of the shaft, it is necessary to remove the shaft from the machine.

To strip the bevel gear end of shaft loosen the Allen type set screws in the bevel gear 16, Fig. 133, and pull it off. Slide off the loose washer 15. Remove the ball and socket bearing 7, loosen the set screws in the drive sprocket 14, slide it off and remove the key. Remove the center ball and socket bearing 7, finally loosening the Allen type set screws in the universal 12, and pull it off.

To reassemble shaft reverse procedure making sure set screws fit in spots provided on shaft. When replacing on machine be careful to line up gears and sprockets carefully before tightening hold-down bolts on the bearing.

DRYER DRUM UNIT (Fig. 134)

Flight Angle Replacement

The flight angles are bolted to the inside of the drum therefore it is necessary to gain entry in thru the drum to replace them by loosening the combustion chamber 1, and sliding it back out of the end of the drum.

Special lock nuts hold the angles tight to the drum and care should be taken to keep them tight at all times.

How To Remove

To replace the trunnion tires 5, and the drive sprocket 6, it is necessary to remove the drum from the machine.

At the charging end of the drum remove the upper portions of the measuring gate 2, so that the two parts of the exhaust manifold 3, can be removed. At the burner end of the drum break the pipe and hose connections to the burner, loosen the combustion chamber 1, so that it can be slid back out of the drum.

Dryer Main Jack Shaft

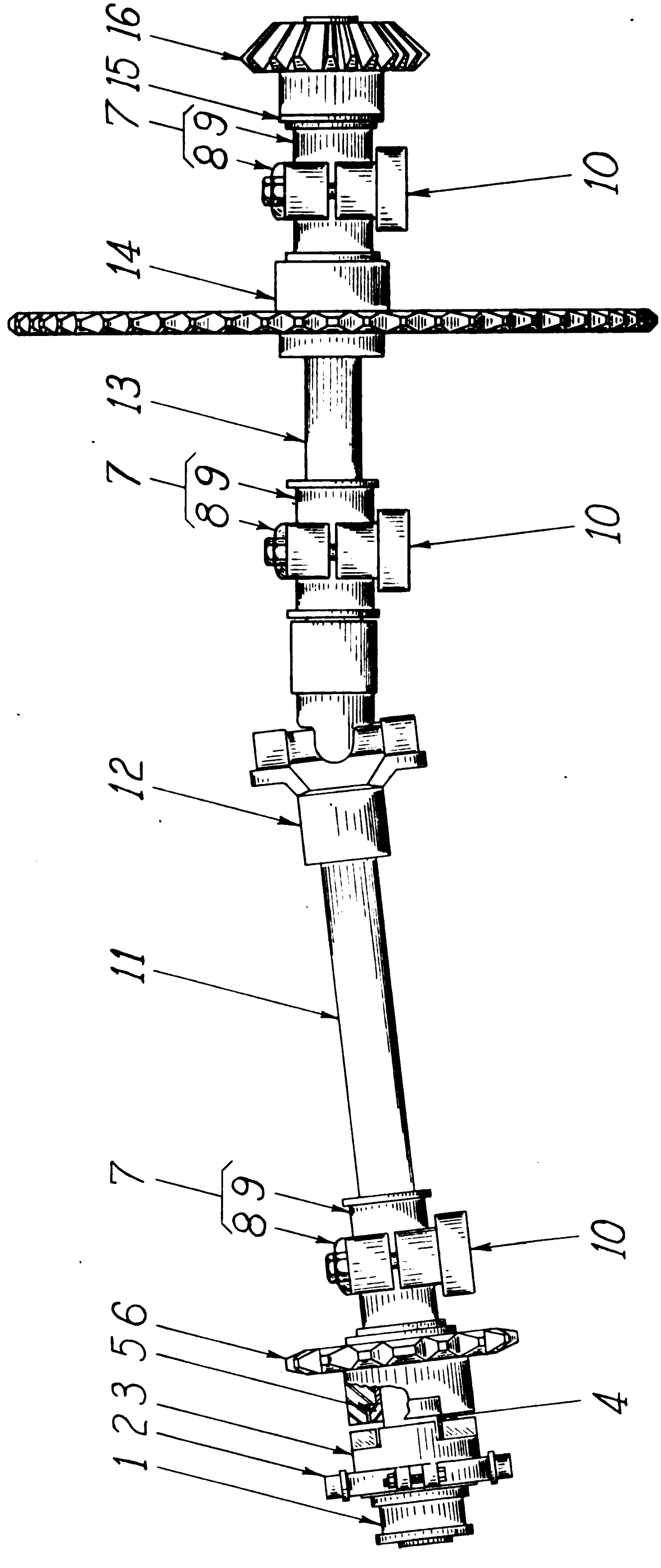


FIGURE 133

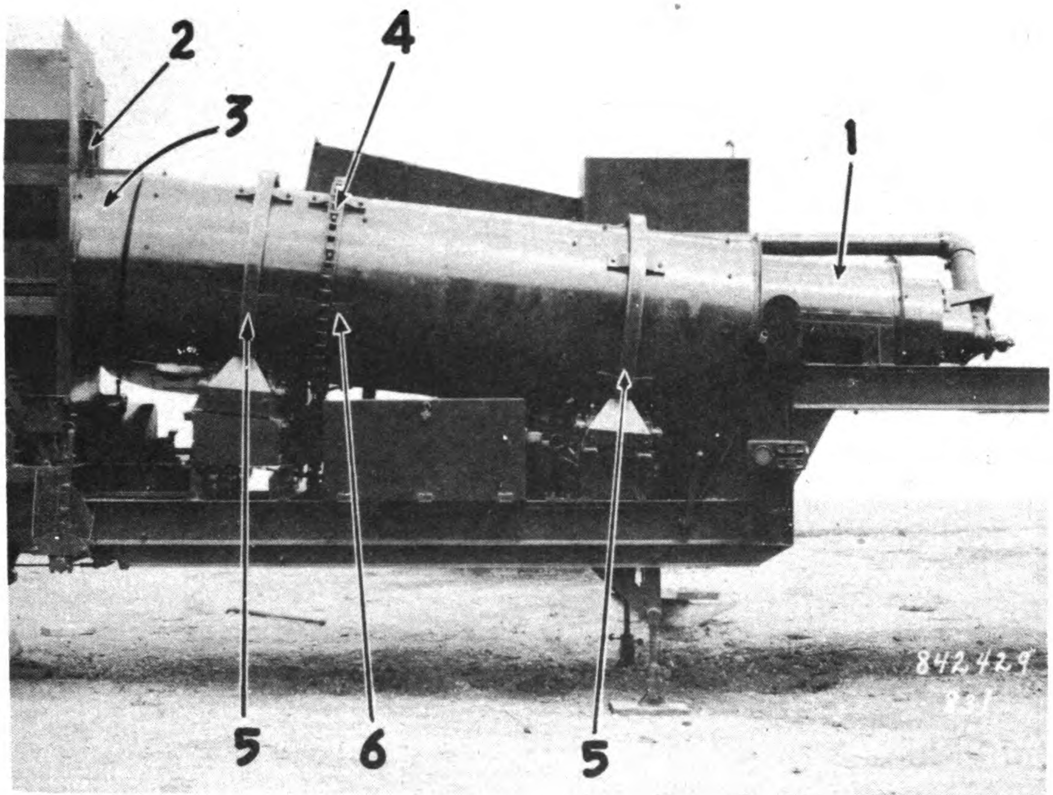


FIGURE 134

Break the drum drive chain 4, at the connection link which is cottered. The drum is free now so that it can be lifted straight up off of the trunnion rollers by making a sling under the drum at each tire and attaching to a crane or chain hoist of ton and a half capacity.

To replace the drum reverse the procedure.

To replace the trunnion tires 5, and sprocket 6, remove the bolts which hold the tires and sprocket to the drum. Special lock nuts are used. It is necessary to remove the tires and sprocket from the charging end of the drum as they will not slip over the welded angle flange on the discharge end.

When bolting new sprocket or tires in place use the special curved shims furnished to get solid bearing.

DISCHARGE CHUTE

The discharge chute directs the hot material from the drum to the conveyor. It is lined with three high carbon plates which can be replaced. They are bolted inside the discharge chutes; one plate lining the bottom of the extension and having protecting bars welded on to it to protect the thermometer thermocouple.

EXHAUST MANIFOLD

The exhaust manifold is made in two sections which bolt around the charging end of the drum. The smaller section on side opposite fan bolts to the hopper and to the other section of the manifold. The larger section bolts to the manifold, to the hopper and to the exhauster fan. Asbestos gaskets provide air-tight connections.

To remove the manifold first remove the upper portion of the measuring gate by removing the bolts which hold the upper screw portion to the gate portion. Then unbolt the manifold sections and remove from the machine.

TRUNNION ROLLERS

Adjustment

To adjust the trunnion rollers it is usually necessary to skew only the trunnions at the burner end of the drum. These rear trunnion assemblies are skewed approximately 3/16" at the factory. When the Dryer has been started and material is flowing through, observe the thrust rollers. If the upper trunnion tire is riding hard against the lower thrust roller, both trunnion rollers should be skewed more by inserting shims between angle clip and bearing, inserting the same amount on both sides to keep the shafts parallel.

When necessary to change skew by increasing the amount of shims, first remove the stop shim bolts which hold the shims tight to the stop angle. Loosen the four bearing hold-down bolts then using a chisel and hammer, shift the roller to the desired position, insert or take-out shims and remove the chisel. Tighten the bolts and replace the stop shim bolt, after checking to see that the full width of the tire rests upon the trunnion roller. It may be necessary to shim up the bearings to get this desired full bearing surface.

How To Remove Trunnion Roller Shaft

The trunnion roller assembly can be easily removed for repairing. Jack the drum up and block it so it does not rest on the roller. Remove the grease pipings from the bearings, and remove the guard. Note the amount of shims used for replacement and remove the bearing hold-down bolts and lift the shaft assembly off the supports.

To replace reverse the procedure checking to see that the amount of skew is correct by a few minutes of operation.

How To Strip Trunnion Shaft

To replace parts on the trunnion shaft remove the assembly as described then remove the two ball and socket bearings 2, Fig. 135, loosen the wire set screws on the roller 7, so that is can be slid off.

To replace, reverse procedure making sure that set screws fit in spots provided and are tightened firmly and equally.

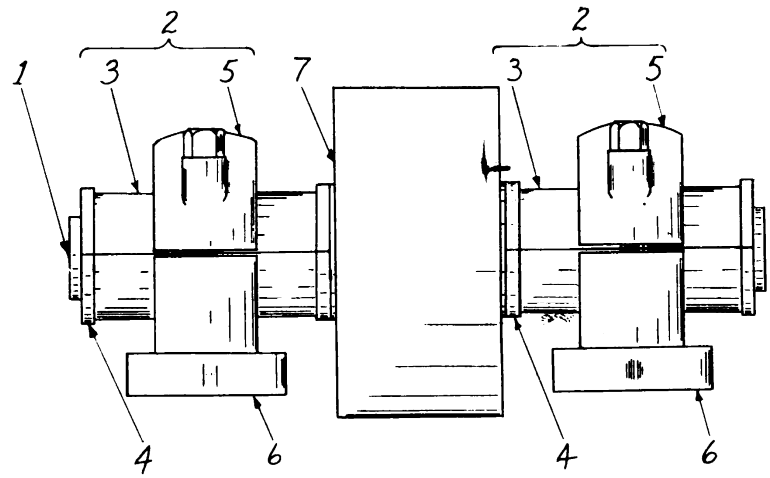


FIGURE 135

THRUST ROLLER

How To Remove

To replace the thrust rollers at the rear of the machine, remove the grease piping and remove the four hold-down bolts which hold the bearing bracket to the frame so that the assembly can be removed.

Loosen the wired set screws on the roller so that it can be slid off shaft.

In replacing, reverse the procedure making sure the set screws fit in the spots provided and are tightened firmly and equally and wired to prevent loosening.

COMBUSTION CHAMBER

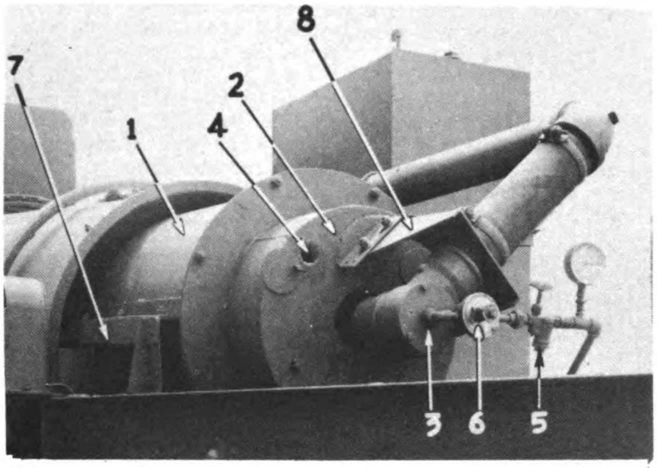


FIGURE 136

How To Remove

To remove the combustion chamber 1, Fig. 136, it is necessary first to remove the combustion cone 2, and the burner 3.

The chamber is held in a cradle-like support 7, being bolted by three bolts on each side; remove these bolts and slide the chamber back on the drum several inches so that it can be lifted up and off.

To replace reverse the procedure.

Replacing Lining

To replace the refractory lining in the drum remove the chamber as described, clean out the old lining carefully saving the asbestos lining next to the metal. Set the chamber up on end and place the asbestos lining inside the shell, fashion a cylindrical plug, 1'6" in diameter, to be inserted as a core so that the material may be added.

Mix 550 lbs. of castable refractory material with not less than 45 or more than 55 quarts of water. Mix well and be sure to get out all the air bubbles; then pour the material in between plug and the asbestos lining and allow it to harden.

Replace the chamber by reversing the removing procedure.

COMBUSTION CONE

How To Remove

The combustion cone 2, Fig. 136, is a refractory lined chamber which bolts to the end of the combustion chamber 1, and forms a support for the burner 3. To remove the cone, remove the burner and oil and air piping, then remove the eight bolts which hold the cone to the chamber so that it can be lifted off.

Replacing Lining

To replace the lining in the cone it is necessary to make four small conical plugs and one large plug so that the proper holes may be tapped.

The air port holes 4, are tapered from 1-1/2" to 2-1/2" in diameter and are about 8" long. The large opening in the middle is 6" in diameter for a distance of 2" then flares out to a diameter of 1' 6".

Mix 150 lbs. of castable refractory with not less than 12 or more than 15 quarts of water being sure to mix well and get out all the bubbles. Pour the material in between the plugs and the shell. Allow it to harden before replacing.

BURNER

How To Remove

The burner 3, Fig. 136, is bolted to the end of the combustion cone 2, consisting of a long slender tube inside of a larger chamber, the tube being used to emit the oil under pressure in an atomized spray. The air is furnished by a 4" pipe from the blower, the oil is furnished thru a 1/2" pipe line from the oil pump on the end of the blower.

To remove the burner from the machine, break the oil line connection at the union at the burner end, remove the hose clamp which clamps the hose at the burner to the long section of pipe and remove the four bolts which hold the burner support bracket 8, to the combustion cone.

To replace reverse the procedure.

HOPPER

How To Remove

The two-bin hopper is supported by four angle legs which bolt to the frame. To remove the hopper from the machine disconnect the lower elevator push arm 3, Fig. 137, which bolts back against the hopper legs. Remove the electrical switch box 4, fastened to the hopper leg opposite the engine side.

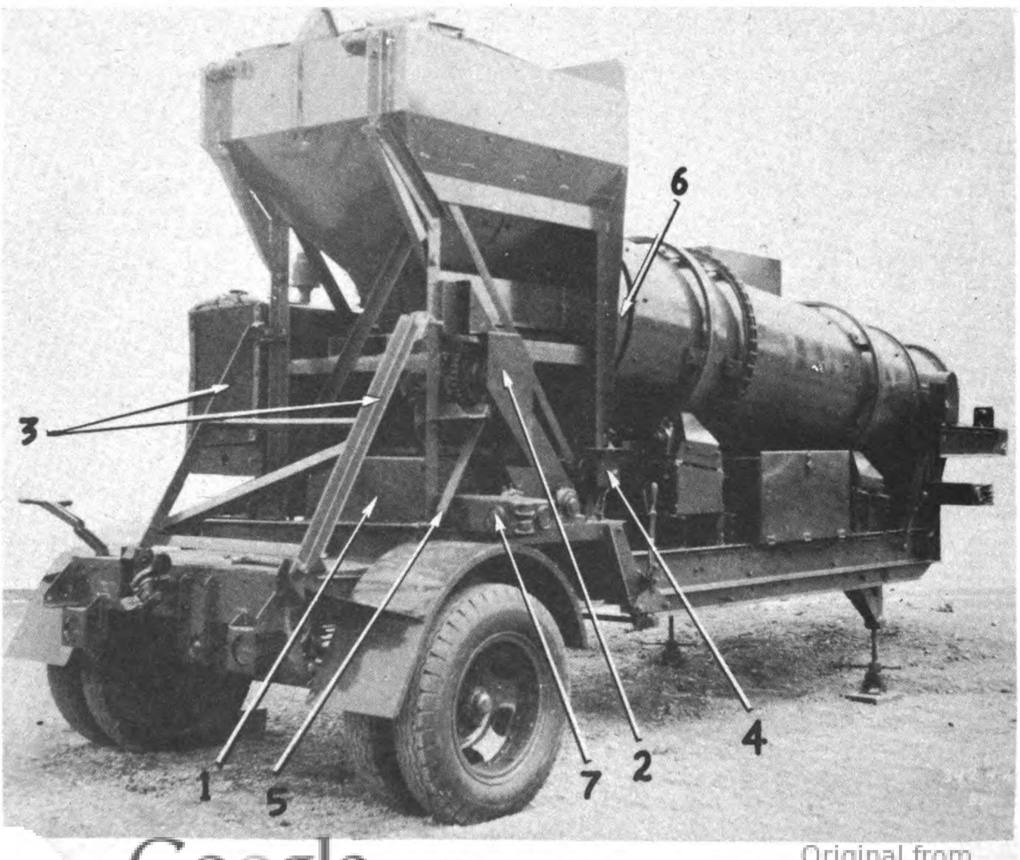


FIGURE 137

Remove the guard 2, over the feeder crankshaft drive chain. Unbolt the guards 1, over the dragline shafts which are bolted to the rear portion of the hopper. Remove the reciprocating feeder lever 5, which is bolted to a bracket attached to the hopper leg. Remove the sections of the manifold 6, which are bolted to the discharge end of the hopper. Break the feeder crankshaft drive chain. Remove the light bracket 7, at the base of the hopper leg. Remove the four hold-down bolts which hold the legs to the frame. The complete hopper assembly can then be lifted off the machine.

Liner Plates

To replace the hopper liner plates, remove the back plate and the grizzly bar screens on top of the hopper to gain access to the inside. The liner plates are bolted to the side of the hopper as in drawing. Simply remove the bolts and replace with new liner plate.

RECIPROCATING FEEDER

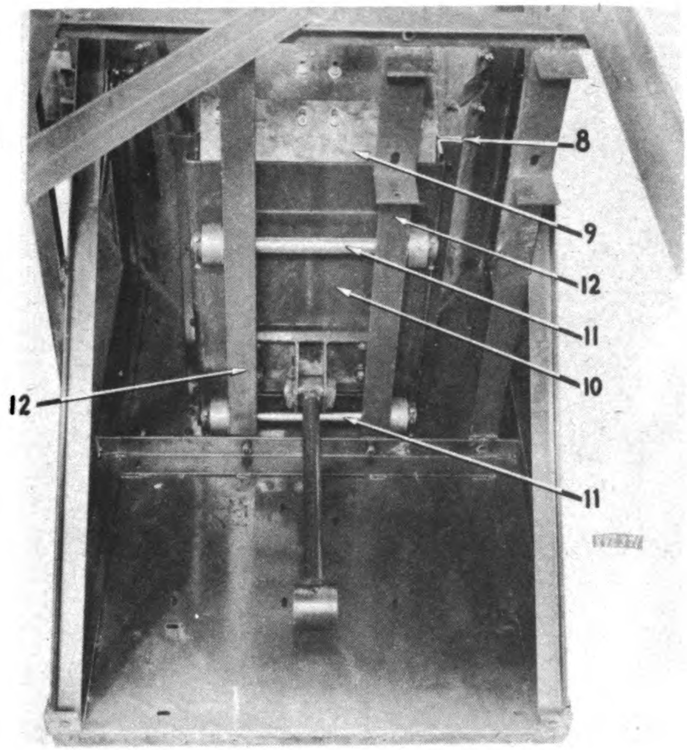


FIGURE 138

To prevent leakage of material from the reciprocating feeder at the bottom of the hopper, Fig. 136, shims 8, are used as wear progresses. At the back of the hopper is a plate 9, Fig. 138, which is bolted to the back side and slotted so that it can be slid down as the bottom edge wears off. On the sides of the hopper, angles are bolted to the hopper and are shimmed so these can be moved downward as the hopper wears off the bottom edge.

The feeder pan 10, is supported by two shafts 11, on which are mounted two rollers apiece. These rollers are held in position by set collars. For removal or replacement it is necessary to remove support angles 12, which are bolted to hopper frame.

FAN AND BLOWER JACKSHAFT (No. 8, Fig. 130)

How To Remove

The fan and blower jackshaft is driven from the end and drive the fan blowers with "V" belt.

To remove the shaft from the machine, remove the main drive chain guard, break the drive chain. Remove the "V" belt guard and remove the "V" belt. Remove the jaw clutch shifter linkage at the engine drive end of the shaft. Remove the bearing hold-down bolts so that the shaft can then be pulled out toward the burner end and off the machine.

To replace, reverse procedure being sure to line up the sprockets before tightening bearing bolt.

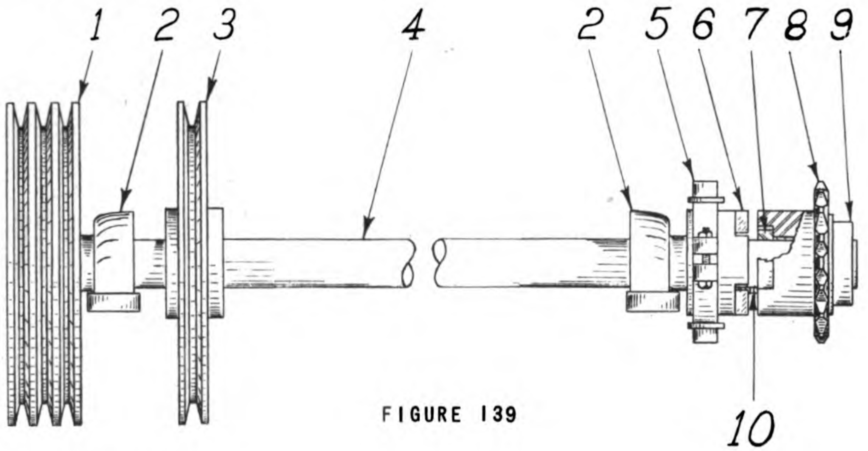


FIGURE 139

How To Strip Shaft

To strip the shaft, remove the set collar 9, Fig. 139, which is set screwed to the shaft, slide off the sprocket 8, and remove the inner set collar 7, and remove the key, slide off the shifter 5, remove the Fafnir bearing 2, and at the other end of the shaft loosen the Allen type set screws in the pulley 1, remove the pulley and key, remove the Fafnir bearing 2, loosen the Allen type set screws in the inner pulley 3, remove this and remove the key.

To reassemble reverse procedure making sure set screws fit in slots provided and that sprocket lines up before tightening bearing.

INTERMEDIATE JACKSHAFT (No. 3, Fig. 130)

How To Remove

The intermediate jackshaft is driven thru bevel gears from the main jackshaft. In turn it drives the drag line drum shaft.

To remove the intermediate shaft, remove the grease pipings from both bearings, remove the gear case as described under the main jackshaft. Break the drag line shaft drive chain, then note the amount of shims under the bearings for replacement and remove the bearing hold-down bolts allowing the shaft to drop out from below.

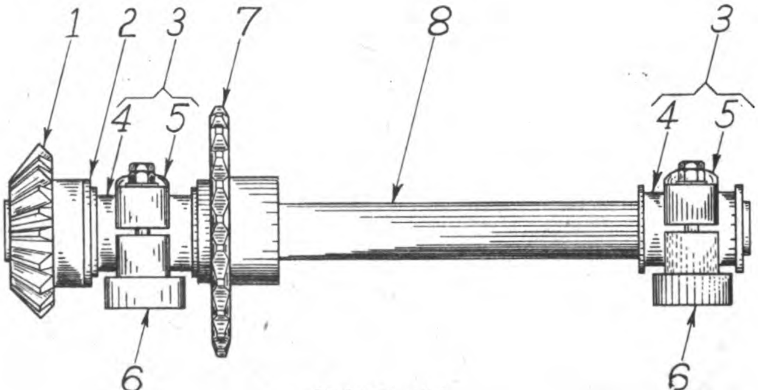


FIGURE 140

To replace, reverse procedure being very careful to check the bevel gear alignment and sprocket alignment before tightening bearing bolts.

How To Strip Shaft

To strip the shaft remove the Allen type set screws from the gear 1, Fig. 140, pull it off the shaft, remove the key and slide off the loose washer 2. Remove the ball and socket bearing 3, loosen the set screws in the sprocket 7, slide it off, remove the key and remove the other ball and socket bearing.

To reassemble reverse procedure making sure set screws fit in spots provided on shaft. Line up bevel gears carefully.

DRAG LINE SHAFTS (Nos. 4 and 5, Fig. 130)

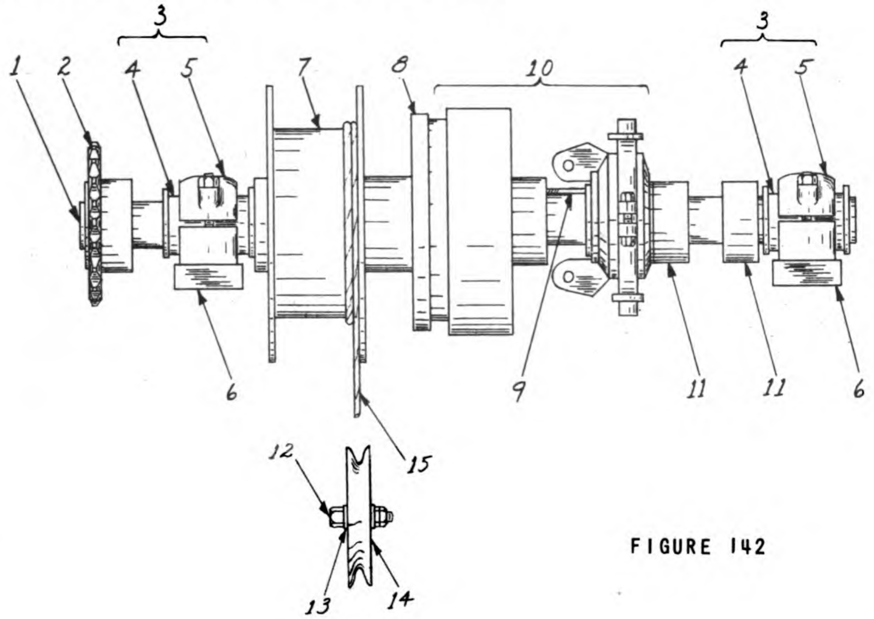


FIGURE 142

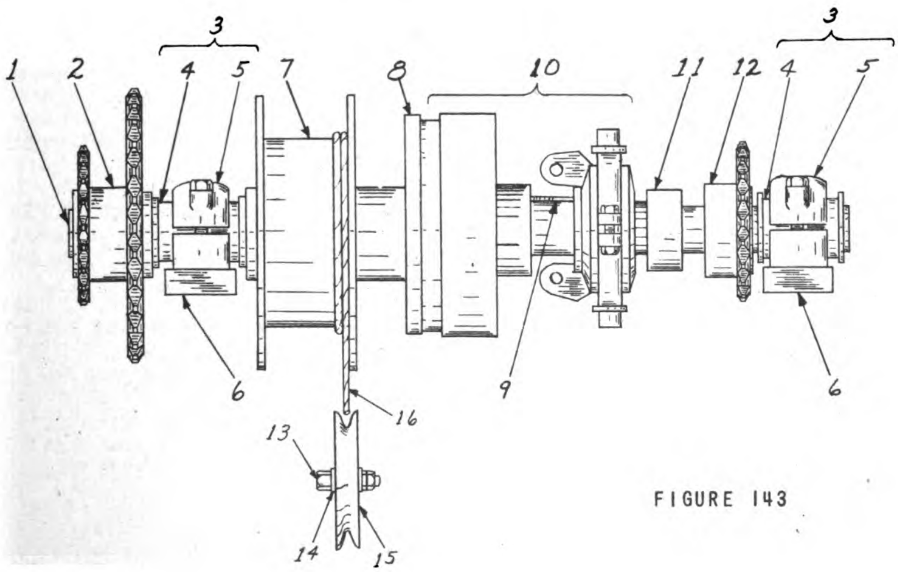


FIGURE 143

How To Remove

The two drag line shafts located underneath the hopper are very much the same assembly. Clutches and chains are protected by a guard 1, Fig. 137, which is bolted to the frame and covers both shafts.

To replace any parts on this shaft, first remove this guard, which is made in three parts, then break the chains necessary for removal of the shaft, remove the brake band which is bolted to a support on the frame, remove the clutch shifter linkages so that the shaft can be removed. Remove the bearing hold-down bolts and remove shaft from position.

How To Strip Shafts

To strip these shafts remove the sprocket 2, Figs. 142 and 143, which is set screwed in the shaft. Remove the ball and socket bearings 3, remove the sprocket 12, which is set screwed into the shaft, remove the shifter set collar 11. Loosen the set screws on the clutch 10, and remove the complete clutch assembly by sliding off the shaft. Remove the cable drum and hub 7.

For clutch details of friction clutch see 8" Friction Clutch in index.

FEEDER CRANK SHAFT

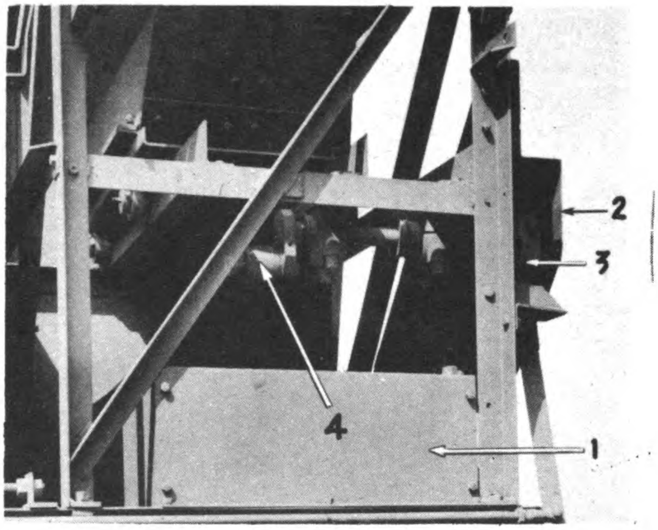


FIGURE 141

How To Remove

The feeder crank shaft bolts to the hopper and one of the reciprocating feeder roller support angles.

To remove the shaft from the machine, remove the chain guard 2, Fig. 141, and jaw clutch linkage 3. Break the drive chain and remove the connecting rod 4. Loosen bearing hold-down bolts which will permit the shaft to be removed.

To reassemble line up the sprockets before tightening bearing hold-down bolts.

BLOWER

How To Remove

The blower 1, Fig. 144, is driven by three V-belts from the fan and blower jackshaft. To remove the blower from the machine, break the oil piping from the small oil pump 2, mounted on the end of the blower. Remove the hose clamp 3, and the section of hose in the air line, then loosen the four hold-down bolts which hold the blower to the frame, slide in slightly so that the three V-belts can be slid off the pulley and then remove the blower from the machine.

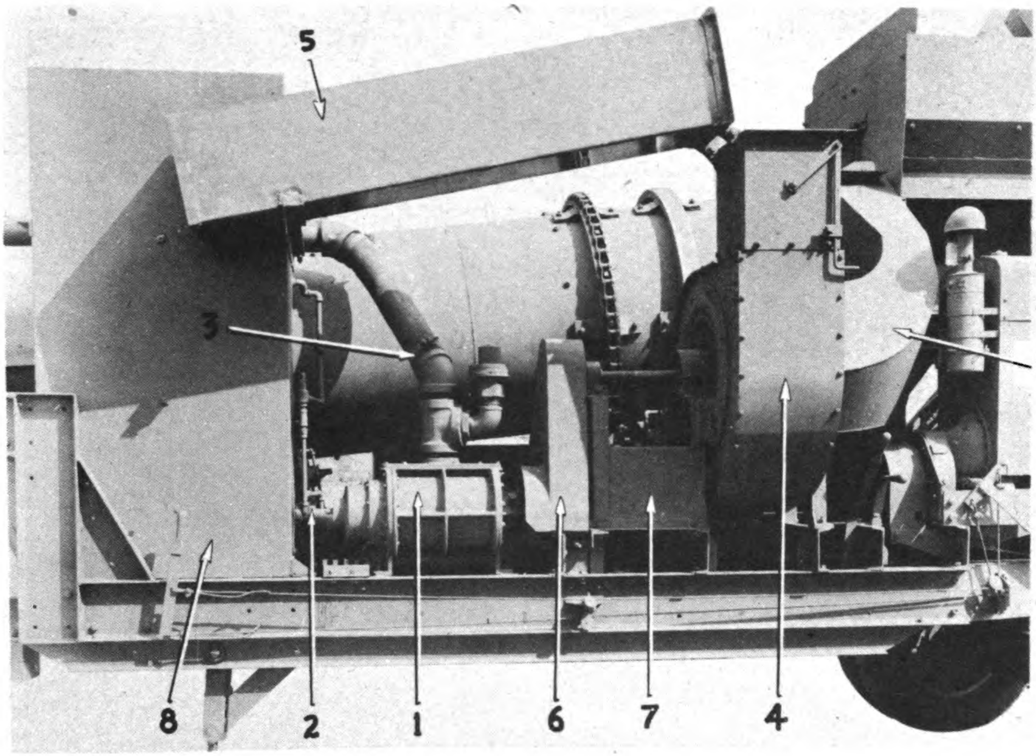


FIGURE 144

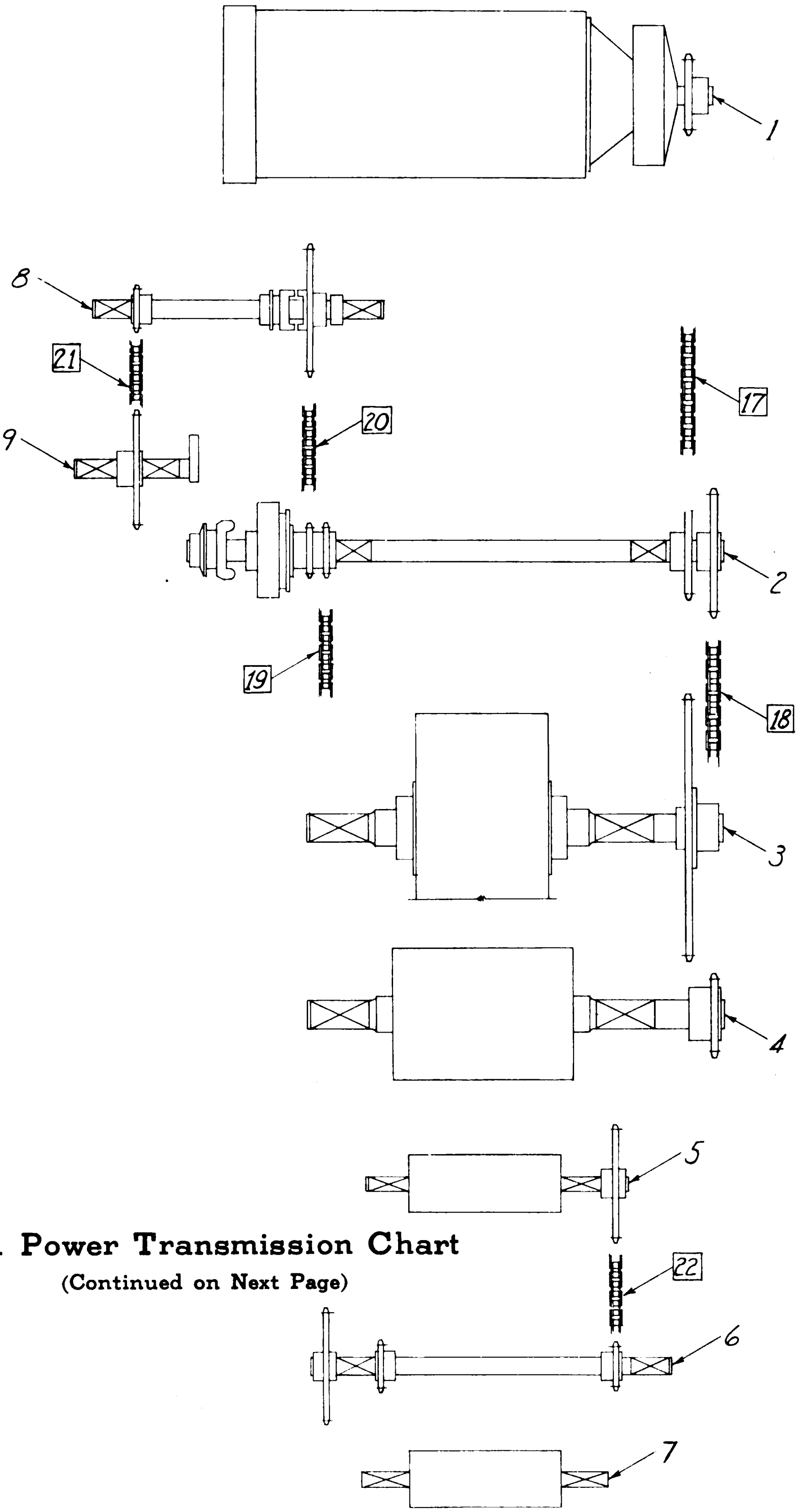
EXHAUSTOR FAN

How To Remove

The exhaustor fan 4, Fig. 144, is driven by a single V-belt from the fan and blower jackshaft. To remove the fan assembly from the machine, first remove the upper portion of the stack 5. Then remove the V-belt guard 6, and pull it from the machine. Disconnect the fan from the air manifold 9. Remove the V-belt and remove the six fan hold-down bolts so that the complete assembly can be lifted off the machine. The fan bearings are supported on a structural stand 7, which bolts to the side of the fan blade housing.

FUEL TANK

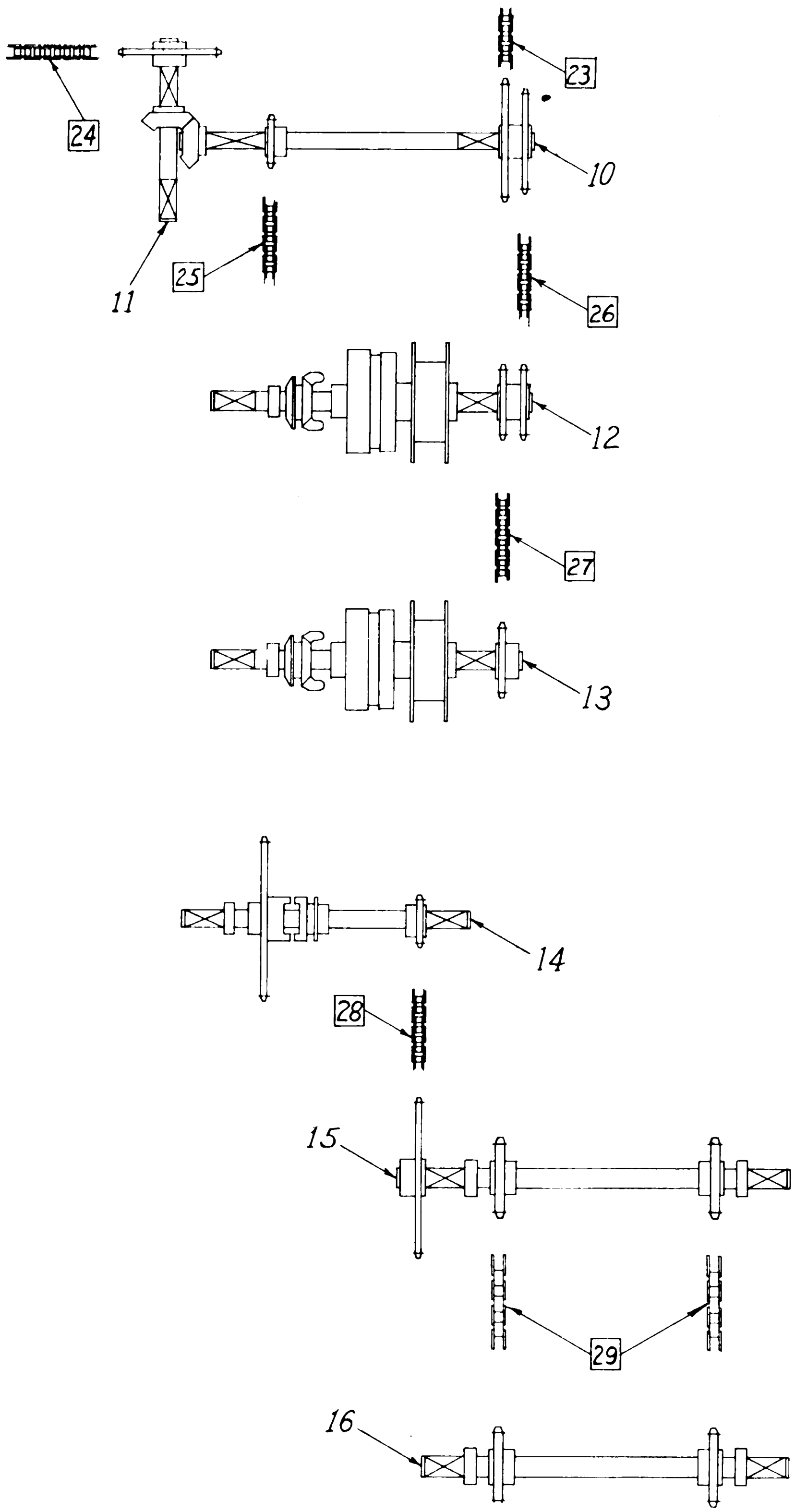
A 250 gallon fuel tank 8, Fig. 144, is bolted to the frame with four bolts. Before removing, however, it is necessary to remove the oil pipe from the side and from the bottom and to remove the "U" bolts which support the 4" air line to the side of the tank. The fuel tank should be kept clean at all times as dirty fuel will cause the burners to clog up. A small strainer is provided in a tee at the bottom of the tank to be cleaned periodically.



821 Power Transmission Chart

(Continued on Next Page)

FIGURE 145



821 Power Transmission Chart

FIGURE 146

821 Soil Preparation Unit

821 Power Transmission Chart

See Fig. 145 & Fig. 146

Shafting Identifications & Speeds

		RPM
	Engine	1400
1	- Reducer Take-off	357
2	- Main Jackshaft	308.4
3	- Smooth Roll Shaft	99.3
4	- Cutter Roller Shaft	503.2
5	- Conveyor Head Shaft	46.4
6	- Conveyor Countershaft	128.5
7	- Conveyor Foot Shaft	46.4
8	- Plate Feeder Countershaft	112.9
9	- Feeder Crankshaft	40.7
10	- Bevel Gear Countershaft	46.4
11	- Elevator Bevel Gear Drive Shaft	46.4
12	- Dragline Shaft	69.6
13	- Dragline Shaft	69.6
14	- Soil Feeder Countershaft	12.3
15	- Soil Feeder Head Shaft	3.3
16	- Soil Feeder Foot Shaft	3.3
	Conveyor Belt Speed	72.9 FPM

Drive Chain & Belt Identification

17 - Main Drive Chain
18 - Cutter Roll Drive Chain
19 - Conveyor Countershaft Drive Chain
20 - Plate Feeder Countershaft Drive Chain
21 - Plate Feeder Drive Chain
22 - Soil Conveyor Drive Chain
23 - Bevel Gear Countershaft Drive Chain
24 - Elevator Drive Chain
25 - Soil Feeder Countershaft Drive Chain
26 - Dragline Shaft Drive Chain
27 - Dragline Shaft Drive Chain
28 - Soil Feeder Drive Chain

Drive Chain and Belt Adjustment

1. Main Drive Chain (No. 17, Fig. 145)

The main drive chain is kept at proper adjustment by the main drive pivot idler.

2. Cutter Roll Drive Chain (No. 18, Fig. 145)

Proper adjustment of the cutter roll drive chain is maintained by a small idler sprocket bolted to the drive chain guard.

3. Conveyor Countershaft Drive Chain (No. 19, Fig. 145)

The conveyor countershaft drive chain can be adjusted for proper slack by moving a small idler sprocket which is bolted to the main frame.

4. Plate Feeder Countershaft Drive Chain (No. 20, Fig. 145)

The plate feeder countershaft drive chain is installed with no slack. If the chain becomes slack after a period of running in, it is necessary to shim the countershaft away from the jackshaft by inserting a stop shim between the bearings and the stop angles.

5. Plate Feeder Drive Chain (No. 21, Fig. 145)

The plate feeder drive chain is installed with no slack. After a period of running in it should become slack, it will be necessary to shift the position of the plate feeder crankshaft by inserting stop shims between the bearings and stop angles or by removing a link from the chain.

6. Soil Conveyor Drive Chain (No. 22, Fig. 145)

Soil conveyor drive chain is a very short chain and is installed with no slack. If it should become slack after a period of operation, it will be necessary to shift the position of the headshaft using the bearing stop blocks.

7. Bevel Gear Countershaft Drive Chain (No. 23, Fig. 146)

Proper adjustment of the bevel gear countershaft chain is maintained by an idler sprocket.

8. Elevator Drive Chain (No. 24, Fig. 146)

The elevator drive chain is the powered take-off chain which drives the 831 Trailer Mounted Bucket Elevator from the Soil Preparation Unit. This drive chain is kept in proper adjustment at all times by a weighted idler sprocket fastened to the frame of the 831 elevator.

9. Soil Feeder Countershaft Drive Chain (No. 25, Fig. 146)

This chain is installed with no slack, provisions for taking up slack being provided by shifting the position of the countershaft. This is done by inserting stop shims between the bearings and the stop angles.

10. Dragline Shaft Drive Chain (No. 26, Fig. 146)

The chain from the bevel gear countershaft to the dragline shaft is a very short chain and installed with no slack. To keep it in proper slack, it is necessary to shift the position of the dragline shaft.

11. Dragline Shaft Drive Chain (No. 27, Fig. 146)

The drive chain between the two dragline shafts is kept properly adjusted by shifting the position of the shafts.

12. Soil Feeder Drive Chain (No. 28, Fig. 146)

The chain from the soil feeder countershaft to the soil feeder head shaft is kept in proper adjustment by a small idler sprocket which is bolted to a frame upright angle.

POWER UNIT

How To Remove

The engine and speed reducer are bolted rigidly to two engine sill angles 1, Fig. 147. The sill angles in turn are bolted to the soil unit frame by four hold-down bolts. The engine should always be left bolted to the sill angles unless it is absolutely necessary to remove.

To remove the engine from the soil unit, first remove the engine throttle extension control. To do this remove the cotter from the pin 2, through the quadrant. This will allow the lever to be pulled off so that the extension 3, can then be pulled out of the way. Disconnect the master clutch control linkage by removing the cotter from the pin 4. Remove the part of the main drive chain guard 5, over the engine sprocket. Break and remove the main drive chain.

Remove the four sill hold-down bolts, remove the two adjusting sill bolts 6. The engine is now free to be lifted off the machine which can be

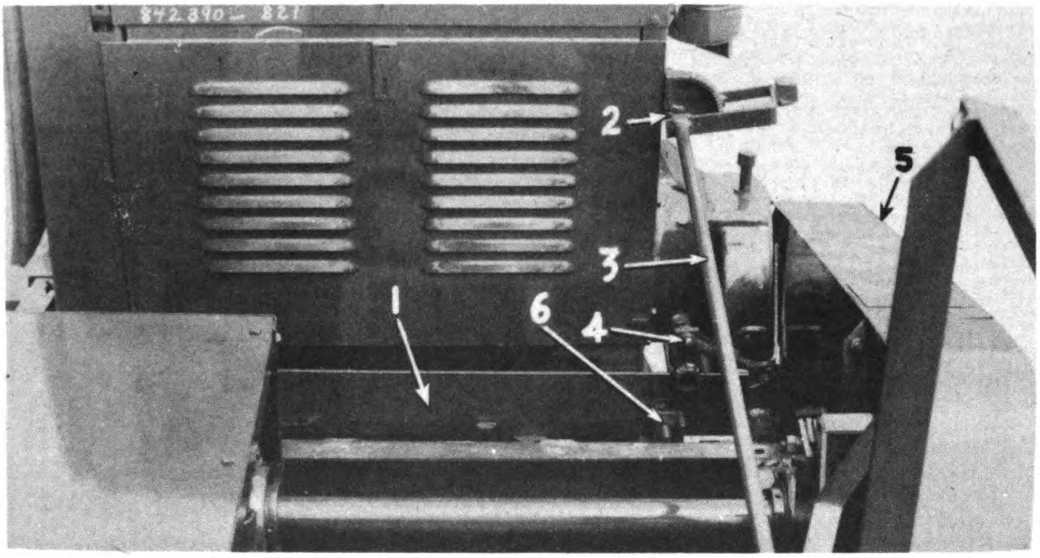


FIGURE 147

easily done by passing a chain under the engine sills to form a sling so that it can be easily lifted off with a chain hoist.

To replace engine, reverse procedure making sure sprockets line up before tightening hold-down bolts.

How To Disassemble

See Engine in Accessory Section.

SMOOTH ROLL SHAFT (No. 3, Fig. 145)

Spring Adjustment

The smooth roll bearings are bolted to sliding supports which are backed by springs 7, Fig. 150, so that any stone passing thru will force the roll back and not damage the rolls or the driving machinery. To adjust these roll springs to proper tension, adjusting nuts on the two long screws thru the springs are used. To increase the tension on these springs, first loosen the lock nuts which bear against the end of the springs and then tighten the other nuts. IMPORTANT: Be sure to keep the same tension on both springs.

ROLL CLEARANCE ADJUSTMENT

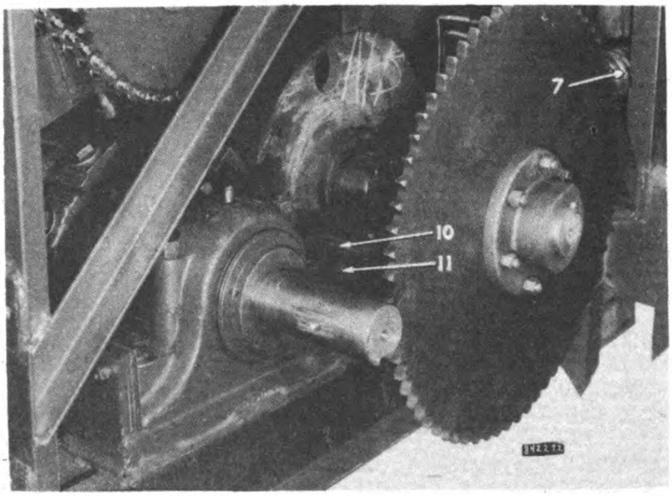


FIGURE 148

From underneath the rolls first measure the clearance distance from the extreme edge of the cutter bars to the surface of the smooth roll. Normally this distance should be about 1/8"; however, depending upon type of clay, it may be varied. To change this clearance adjustment, first remove the lower sections of the main drive chain guard. This is necessary to gain access to the roll clearance shim 1, Fig. 148, on the drive side of the roll. Release all tension from the spring 7, Fig. 150, by slacking off on the spring adjusting nut. Remove the roll clearance shim bolts 11, Fig. 148. Then add or remove roll clearance shims 10, as needed to get the proper clearance. This may require driving the shims out with a hammer or chisel.

Replace shim bolts, take up on the spring adjusting nuts to get the proper tension, then replace chain guard section.

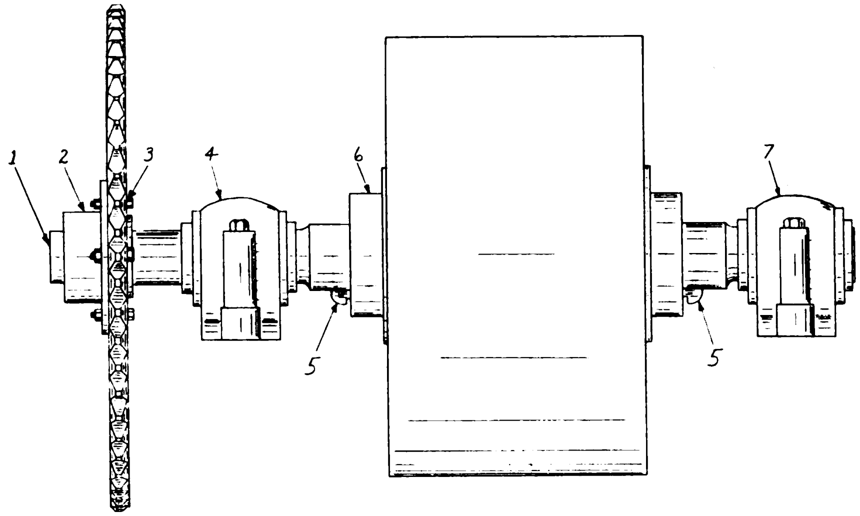


FIGURE 149

To Replace Outer Bearing (Fig. 149)

To replace outer bearing 4, Fig. 149 & 150, and sprocket 3, on the smooth roll, it is not necessary to remove the roll assembly from the machine.

Remove the lower sections of the chain guard; remove the main drive chain. Loosen set screws which hold the sprocket 3, to the shaft; remove sprocket and key. Sprocket 3, is bolted to a hub 2, by six bolts. Remove bearing 4, hold-down bolts noting position of all shims so that bearing can be replaced without mis-aligning. Loosen the bearing so it is free on shaft. (See discussion on Ahlberg pillow blocks.) Remove bearing cap grease piping and remove bearing cap. Loosen the other bearing cap. Using a chain hoist

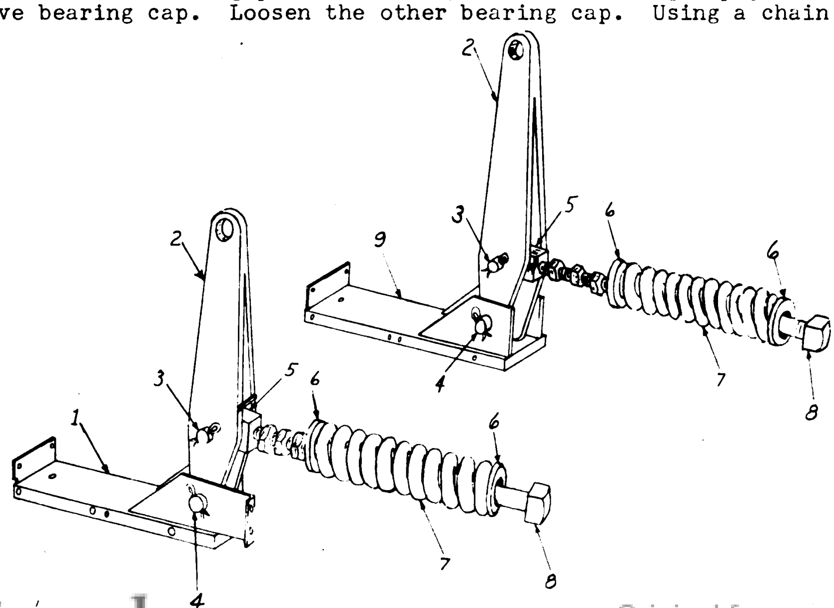


FIGURE 150

underneath the shaft, lift up slightly and slide bearing off leaving the base intact if desired. Replace with new bearing making sure not to let the set collars slide out from bearing seals. See special section on Ahlberg bearings. Replace the bearing caps, grease piping. After the bearing bases have been bolted to position turn the shaft to align bearings, tighten bearing caps. Replace sprocket, check alignment, and tighten on shaft. Replace chain and the sections of the chain guard.

To Replace Inner Bearings

To remove inner bearing 7, Fig. 149, it is likewise not necessary to remove the whole assembly to replace.

Remove the dust cap 20, Fig. 154, which is held in place by three Allen set screws. Loosen the bearing 7, Fig. 149, so it is free on the shaft. Remove shims 21. Remove the bearing cap and loosen the other bearing cap. Lift shaft up slightly as before to slide bearing off shaft leaving base intact. Replace with new bearing, be careful not to damage bearing and not to let collars slide out from underneath the bearing seals. Replace the bearing cap and grease piping. Tighten the bearing base down into position with the hold-down bolts and tighten both bearing caps. After making sure that the sprocket has not been misaligned during the operations, put on the dust seal cap and tighten the three set screws.

REMOVAL OF CRUSHER ROLLS

The removal of the crusher rolls is a major operation, requiring removal from directly above, using a chain hoist and necessitating stripping quite a bit of machinery at engine end of the machine.

Remove the main drive chain guard 1, Fig. 151, which is made in three sections and which bolts to the frame. Break and remove the two chains which drive the crusher rolls. Remove the drive sprockets from the end of the shafts. Release all tension in the roll spring adjusting screws 7, Fig. 152. Remove the shims and slide the smooth roll back as far as it will go toward the engine. Remove all the bearing base hold-down bolts, grease piping and shims.

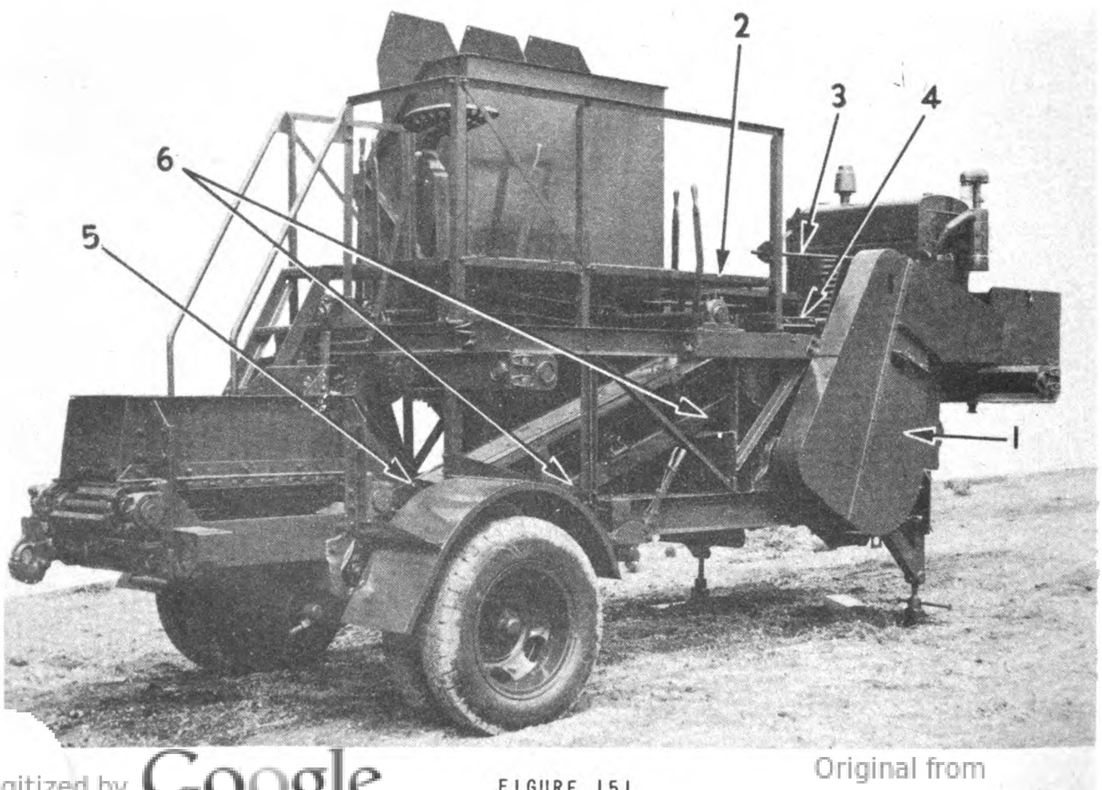


FIGURE 151

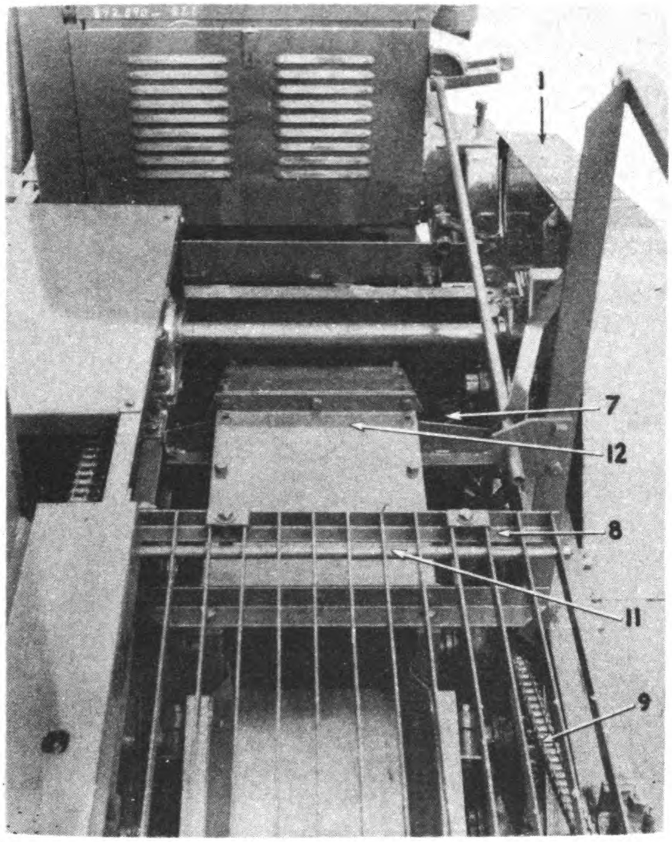


FIGURE 152

On top of machine it will be necessary to remove the forward section of the platform grill work 2, Fig. 151, which is clamped to an angle support 8, Fig. 152, which must likewise be removed. The throttle extension lever 3, Fig. 151, is also removed. Then from above and below remove the sections of the housing 12, over the crusher rolls.

Since the crusher rolls will have to be turned at right angles so that they can be pulled up through the frame, it will be necessary to move the soil conveyor down out of the way about 2'. To do this, first break the conveyor drive chain 9, Fig. 152, then underneath the soil hopper remove the bolted housing 5, Fig. 151, connection to the soil hopper. Then remove all the conveyor frame hold-down bolts 6, so that the whole conveyor assembly can be slid back about 2 or 3'.

The cutter roll must be removed first so attach a chain hoist from above to the ends of the shaft lifting up slightly and then guiding it around so that it will be turned at right angles. To do this it will be necessary to slide it around a vertical frame angle in the interior and then over the horizontal angle which supports the conveyor head shaft. Now that the cutter roll is at right angles, it can be lifted up and off the machine.

The smooth roll can then be removed in approximately the same fashion by first turning it at right angles to its operating position.

To replace the crusher rolls simply reverse the procedure making sure to line up all drives and sprockets before tightening any shafts in position and to adjust the crusher rolls for proper clearance and tension to the springs.

CUTTER ROLL

Cutter Bar Replacement (Fig. 153)

The cutter bars 7, Fig. 153, are clamped to the face of the cutter roll 6, by retainer caps 5. From underneath the machine remove these re-

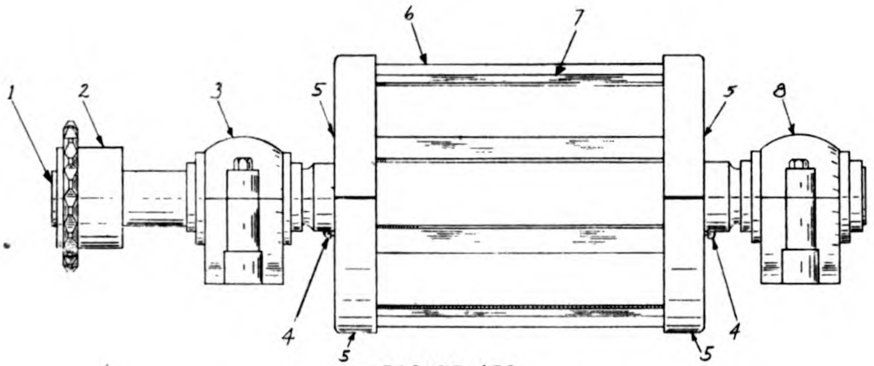


FIGURE 153

tainer cap bolts, allowing the cap and the cutter bars to drop out. Replace with new cutter bars. Replace cap and tighten onto roll. After new bars have been replaced it is necessary to check the roll clearance adjustment as described under the smooth roll section.

Outer Bearing and Sprocket Replacement

To replace the sprocket 2, Fig. 153, and the outer Ahlberg Ball Bearing 3, first remove the sections of the chain guard and remove the drive chain. Loosen the set screws in the sprocket and slide off. Remove bearing hold-down bolts so that the bearing will be free for removal. Loosen the bearing cap on the other bearing 8, so that the shaft can be lifted up slightly. Now slide the bearing off, leaving the base intact if desired.

Replace with new bearings noting instructions on Ahlberg Bearings as described in the special bearing section. Rotate shaft to align bearings and tighten in place, replacing sprocket, chain and guard.

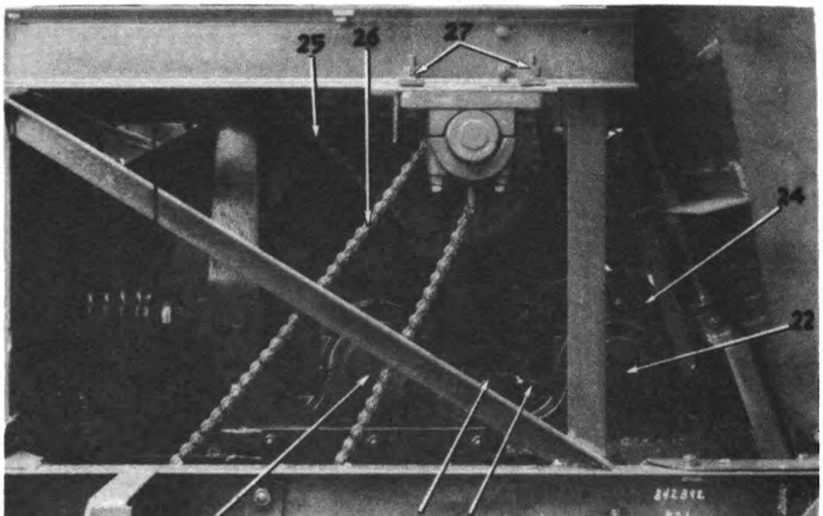


FIGURE 154

Replacing Inner Bearing

To replace the inner bearing 8, Fig. 153, remove the dust cap 22, Fig. 154, which is held in place by three set screws. Remove the bearing hold-down bolts and shims 23, to free it for removal. Remove the bearing cap so that the base may be left intact while sliding the bearing off shaft. Remove the inner feeder measuring gate and scale 24. Loosen the bearing cap on the other bearing so that the shaft may be lifted up slightly to allow the bearing to be slid off the shaft.

Soils Unit Main Jack Shaft

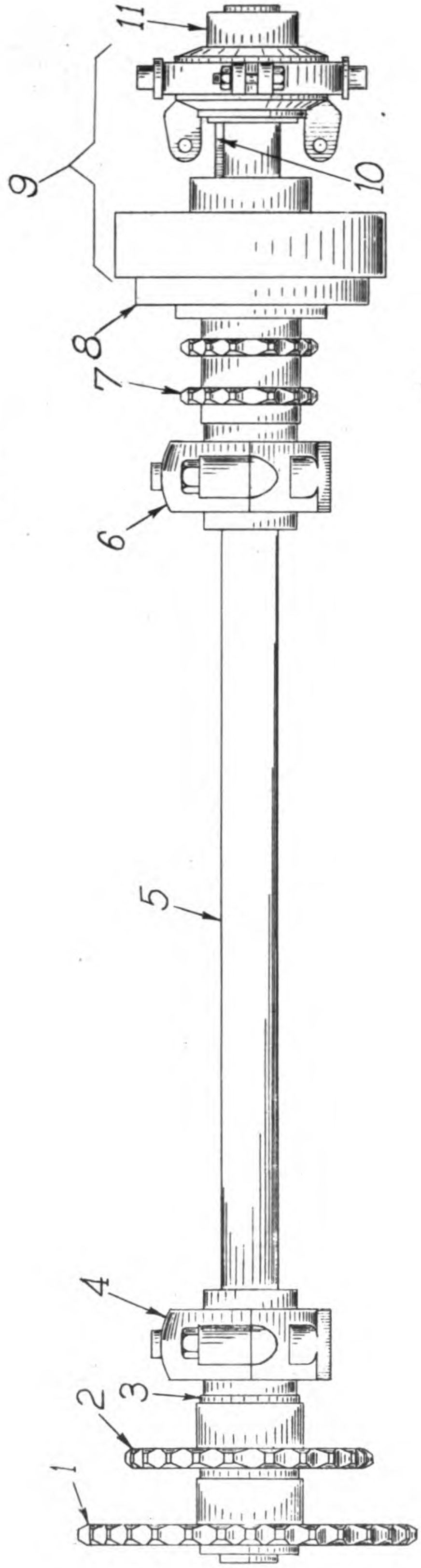


FIGURE 155

Replace with new bearing following the special instructions, replacing cap, rotating shaft to align the bearings and tightening the bearings in place checking to see that the sprocket alignment has not been changed.

MAIN JACKSHAFT (No. 2, Fig. 145)

How To Remove

To remove the main jackshaft for replacement of any part on the engine drive end, first remove the section of the main drive chain guard over the sprocket. Then remove the drive chains, both the main drive and the cutter roll drive chain. On the other end of the shaft remove the guard which is bolted over the friction clutch. Remove the friction clutch shifter linkage and the two drive chains on that end of the shaft. Loosen the bearing adjusting bolts and loosen the bearing hold-down bolts which will allow the shaft to be lifted up and off the machine.

In replacing the main jackshaft, be sure to align all sprockets before tightening down hold-down bolts.

Stripping Clutch End of Shaft

It is not necessary to remove the shaft from machine to replace any of the parts on the clutch end of the main jackshaft. Remove the guard over the friction clutch and remove the clutch shifter linkage. Then loosen the Allen set screws in the set collar 11, Fig. 155, and slide off. Loosen the wired set screws on the clutch 9, and slide the complete clutch assembly off the end of the shaft. The sprocket and drum assembly 7 & 8, can then be slid off the shaft. Support the shaft so that the Dodge-Timken roller bearing 6, can be removed. To reassemble, reverse procedure making sure set screws fit in the spots provided on the shaft. For details of the clutch see "8" Friction Clutch" in index.

Stripping Engine Drive End of Shaft

Remove main drive chain guard and break the drive chain. Loosen the set screws in the two drive sprockets 1 & 2, Fig. 155, so that they can be pulled off. Slide off the loose washers 3, remove the Dodge-Timken roller bearing 4.

PLATE FEEDER COUNTERSHAFT (No. 8, Fig. 145)

How To Remove

To remove the plate feeder countershaft to replace any of the parts, first break the two drive chains 25, 26, Fig. 154, so that the bearing bolts 27, can be removed allowing the shaft to be pulled off the machine.

How To Strip Shaft

To strip the shaft for replacement, remove the ball and socket bearings 2, Fig. 156, at each end of the shaft; loosen the set screws in the sprocket

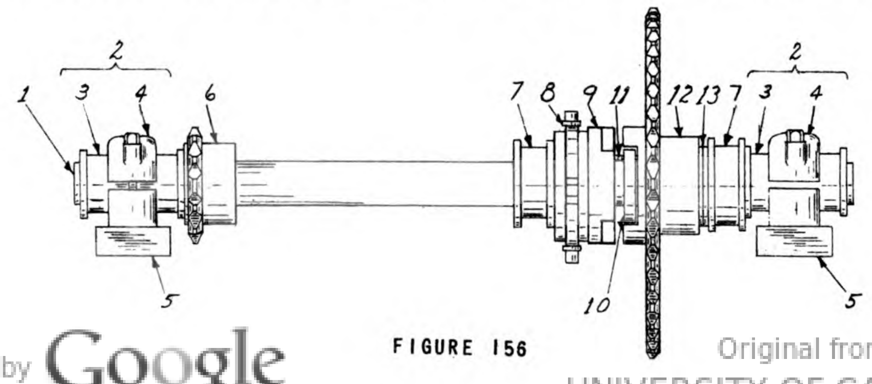


FIGURE 156

6. Loosen the set collar 7. Slide it off. Loosen the set screws in the sprocket 12, so it can be slid off. Remove the set collar 10. Slide off the shifter 8, and remove the inner set collar 7.

In reassembling the shaft be sure to get the set screws fitted in spots provided on shaft. Line up sprockets carefully before tightening bearing base hold-down bolts.

PLATE FEEDER CRANKSHAFT (No. 9, Fig. 145)

How To Remove

To remove the plate feeder crankshaft for replacement of any of the parts, remove the pin which connects the connecting rod to the eccentric. Break the drive chain, then remove the bearing hold-down bolts so the shaft will be free.

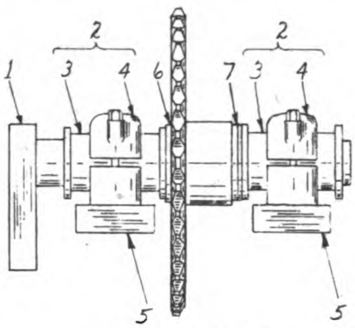


FIGURE 157

How To Strip Shaft

To strip the shaft, remove the ball and socket bearing 2, Fig. 157. Slide off the washer 7. Remove the sprocket 6. Slide it off. Remove the other bearing 2.

CONVEYOR COUNTERSHAFT (No. 6, Fig. 145)

How To Remove

The conveyor countershaft is driven from the main jackshaft and in turn drives the conveyor and the elevator bevel gear countershaft. To remove it from the machine for replacement, first remove the portion of the platform grill directly above it which is clamped to the angle support at four points, then break the three drive chains and remove the bearing bolts so that the shaft can be lifted off the machine.

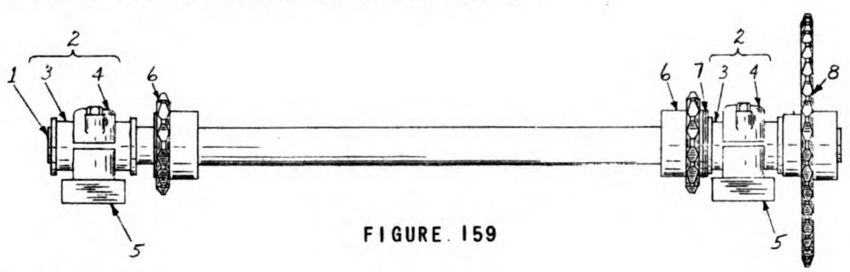


FIGURE 159

How To Strip Shaft

To strip the conveyor countershaft assembly, loosen the set screws in the sprocket 8, Fig. 159, slide the sprocket off, remove the ball and socket bearing 2, slide off the loose washer 7, release the set screws in the sprocket 6, slide it off and at the other end of the shaft remove the ball and socket bearing 2, and remove the sprocket 6.

In reassembling the shaft make sure set screws fit in spots provided and be careful to line up sprockets carefully before tightening bearing hold-down bolts when the shaft is replaced on the machine.

ELEVATOR BEVEL GEAR COUNTERSHAFT (No. 10, Fig. 146)

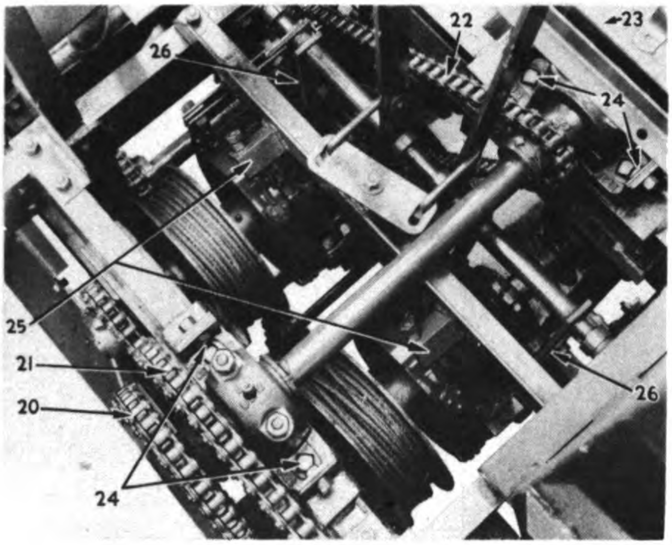


FIGURE 158

How To Remove

The elevator bevel gear countershaft is driven from the conveyor countershaft and drives the elevator drive shaft thru bevel gears; also driving the drag line shafts and the soil feeder countershaft. To remove it from the machine, remove the portion of the platform grill work directly above it which is clamped to angle supports at four points. Break the three drive chains 20, 21, 22, Fig. 158. Drain the lubricant from the gear box 23, and remove the small portion of the gear box which covers the shaft and bolts to the inside. Remove all bearing hold-down and shim bolts 24. The shaft is now free so that it can be shifted to disengage the bevel gears so that it can be taken off the machine.

In replacing this shaft on the machine it is necessary first to line up the bevel gears. Then make the necessary adjustments in lining up the sprockets if necessary.

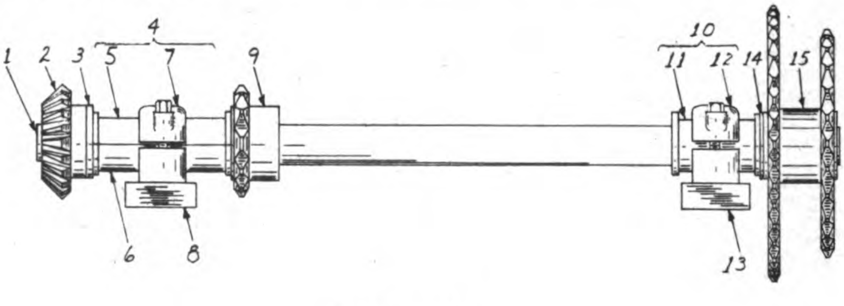


FIGURE 160

How To Strip Shaft

To strip the shaft for replacement of any parts, loosen the wired set screws in the bevel gear 2, Fig. 160, so that it can be slid off. Remove the key and slide off the loose washer 3, remove the ball and socket bearing 4, loosen the wired set screws in the sprocket 9, and slide it off. At the other end of the shaft loosen the wired set screws in the double sprocket 15, slide it off. Slide off the loose washers 14, remove the ball and socket bearing 10.

In reassembling make sure set screws fit in spots provided on shaft.

ELEVATOR DRIVE SHAFT (No. 11, Fig. 146)

How To Remove

The elevator drive shaft is a small stub shaft which is driven from bevel gear countershaft and drives the 831 portable elevator unit. To remove it from the machine, loosen and remove all bearing hold-down and shim bolts, drain the bevel gear lubricant, remove the shaft cover portion of the bevel gear case so that the shaft can then be lifted off the machine.

In replacing shaft on machine, line up bevel gears carefully, see special section on bevel gears.

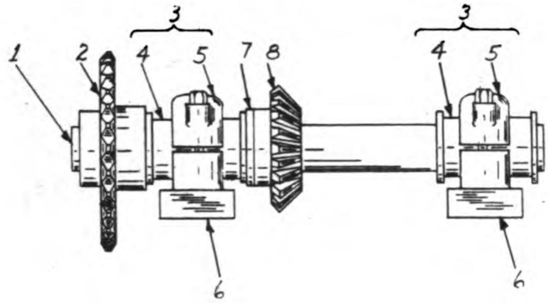


FIGURE 161

How To Strip Shaft

Stripping the shaft for replacement of any part remove it from the machine and loosen wired set screws in sprocket 2, Fig. 161, and slide it off, remove ball and socket bearing 3, slide off the loose washer 7, loosen the wired set screws in the bevel gear 8, slide it off and then remove the ball and socket bearing 3.

DRAG LINE SHAFTS (Nos. 12 and 13, Fig. 146)

How To Remove

The drag line shafts must be removed from beneath the operator's platform. First break the drive chains necessary for removal, then disconnect the brake bands at support point 25, Fig. 158, on the cable drums and disconnect the shifter linkages 26, on the friction clutches. Remove the bearing hold-down bolts so that the shaft can be removed from below.

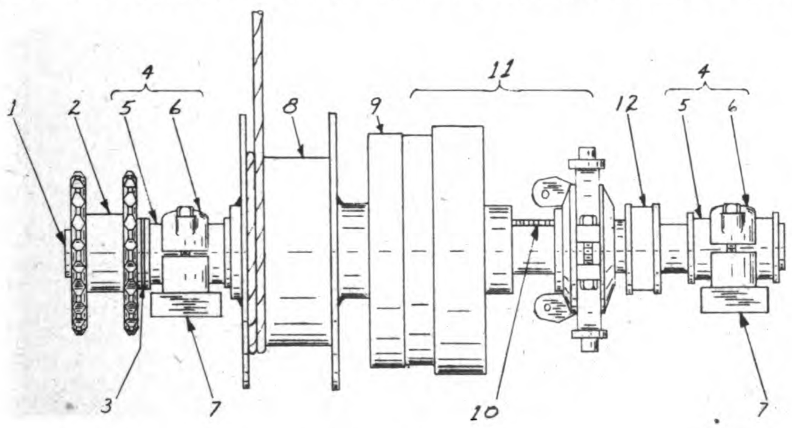


FIGURE 162

How To Strip Shaft

The two shafts are practically the same assembly. To strip the shaft for removal of any part, loosen the set screws in the sprocket 2, Fig. 162 and 163, slide if off, remove the key so that the ball and socket bearing 4, can be removed. Slide off the loose cable drum and hub assembly 8. Remove

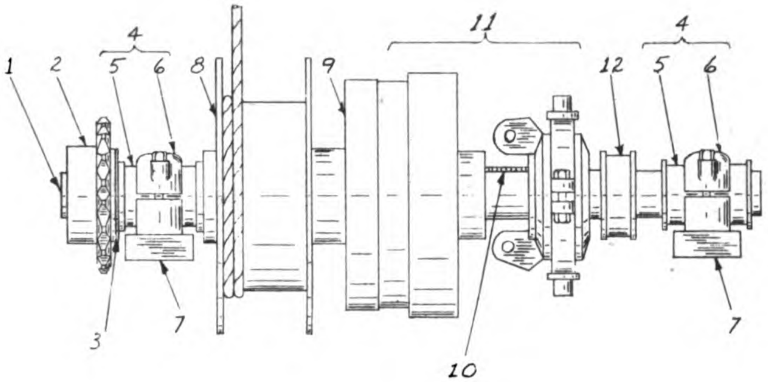


FIGURE 163

the ball and socket bearing 4, at other end of the shaft. Loosen the wired set screws in collar 12, slide it off and then loosen the wired set screws in the clutch 11, and slide off the complete clutch assembly. For details of the clutches see 8" Friction Clutch in index.

SOIL FEEDER COUNTERSHAFT (No. 14, Fig. 146)

How To Remove

The soil feeder countershaft is driven from the elevator bevel gear countershaft and drives the soils feeder. To remove it from the machine, remove the two drive chains, then remove the bearing and shim bolts so that the shaft may be removed from the side of machine.

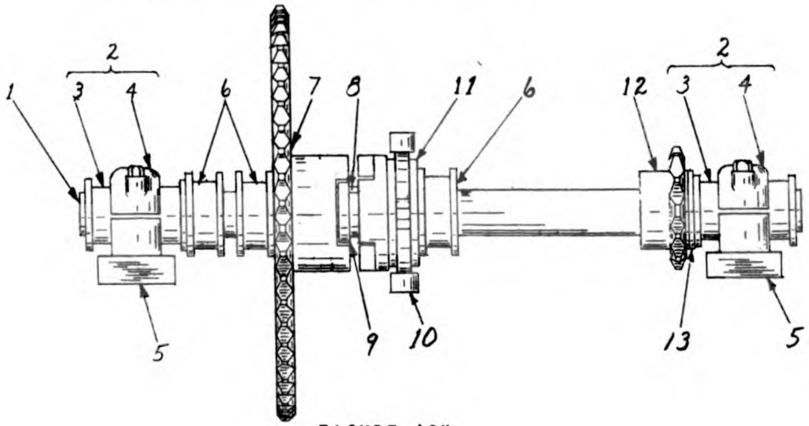


FIGURE 164

How To Strip Shaft

To strip the shaft for replacement of any part remove it from the machine and slide off the two ball and socket bearings 2, Fig. 164, on either end of the shaft. Remove the two set collars 6, so that the sprocket 7, can slide off. Loosen the Allen type set screws in the set collar 9, slide it off. Slide off the shifter assembly 10, loosen the set screws in the sprocket 12, and the collar 6, so that they can be slid off.

In reassembling parts be sure set screws fit in spots provided and that jaw clutch engages properly.

AGGREGATE HOPPER

How To Remove

The aggregate hopper is bolted to the main frame of the machine at 1, 2, 3, Fig. 165, and may be removed. An overhead hoist of some sort is necessary since it must be lifted straight up from the machine. Remove the

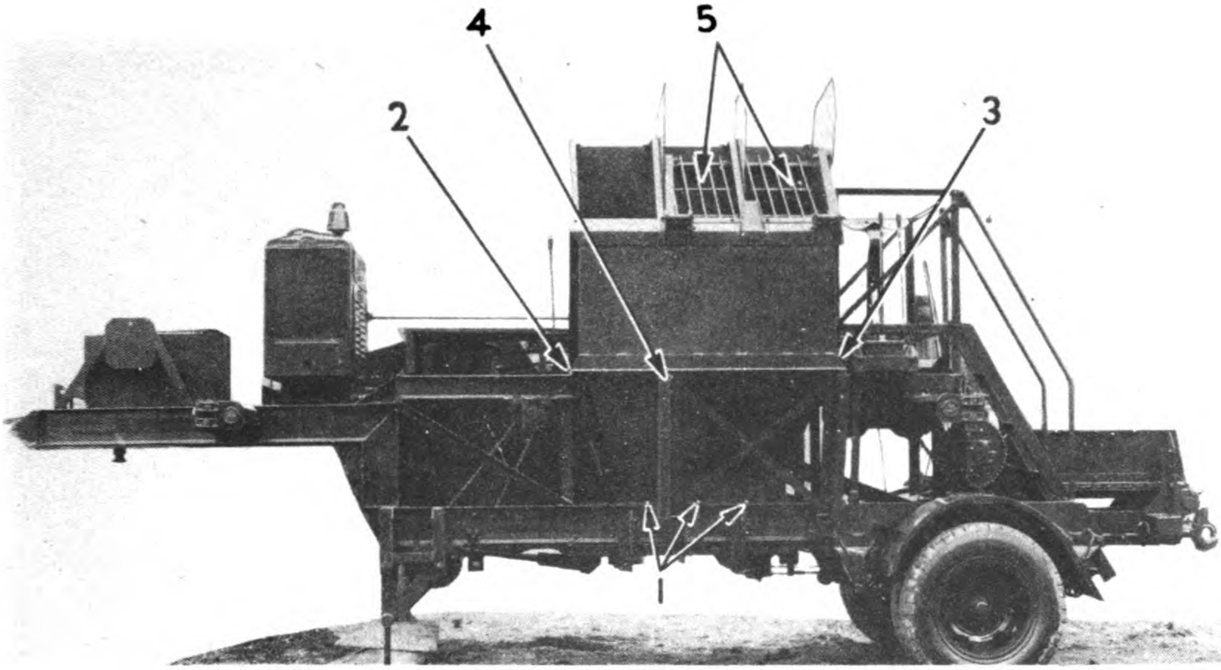


FIGURE 165

lower elevator push arm 4, and then remove the hold-down bolts on the lower main frame channel 1. Remove the hold-down bolts 2, 3, along the side of the hopper at the bend line, then by attaching with the crane hoist and carefully lifting up so that all obstructions are cleared, the hopper can be removed without further dismantling.

To replace the hopper liner plates it is not necessary to remove the hopper from the machine. Remove the grills 5, at the top of the hopper to gain entry inside; remove the old plates which are bolted to the sides and replace with new ones. Note position of plates shown in the drawing.

RECIPROCATING PLATE FEEDER

How To Remove

The reciprocating plate feeder is driven by a connecting rod 15, Fig. 166, which is eccentrically connected to the feeder crankshaft. It is supported by two shafts 10, which have two rollers apiece 12, each shaft in turn being supported at the end by brackets which bolt to the main frame. Therefore to remove the plate feeder remove the support brackets to allow the whole assembly to be removed from below.

How To Adjust

To adjust the reciprocating feeder to prevent spillage of material, angles 3, 4, 5, 6, 7, are bolted to the bottom of the hopper and can be shimmed downward as the bottom edges wear off. To make this adjustment, therefore, when spilling occurs, simply loosen the bolts and insert more shims 1 & 2, until there is a good fit again against the feeder plate 9.

How To Strip Shaft

To strip the reciprocating feeder roller shaft 10, remove from the machine by removing the support brackets, loosen the set screws in the collars on the support brackets, shaft can be removed, then loosen the set collars 11, on each side of the four rollers 12, and slide them off.

Reciprocating Plate Feeder

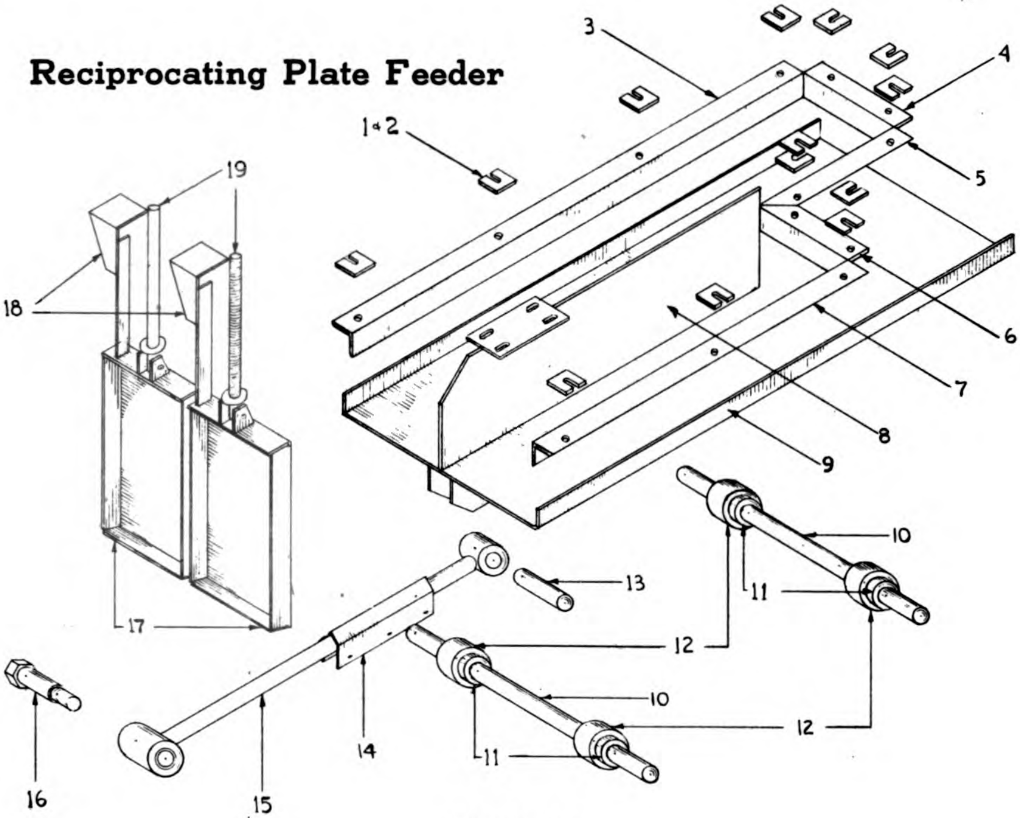


FIGURE 166

SOIL CONVEYOR

FIGURE 167

It is not necessary to remove the complete conveyor frame assembly from the machine for replacement of belt, head shaft roller, or foot shaft.

To remove the head shaft 20, Fig. 167, from the machine, first slack up on the belt by loosening the adjusting screws on the foot pulley 21. Remove the drive chain 22, from the conveyor countershaft, then remove the portion of the housing 23, over the crusher roll directly in front of the conveyor head pulley. This will allow the pulley then to be removed from directly over the cutter roll.

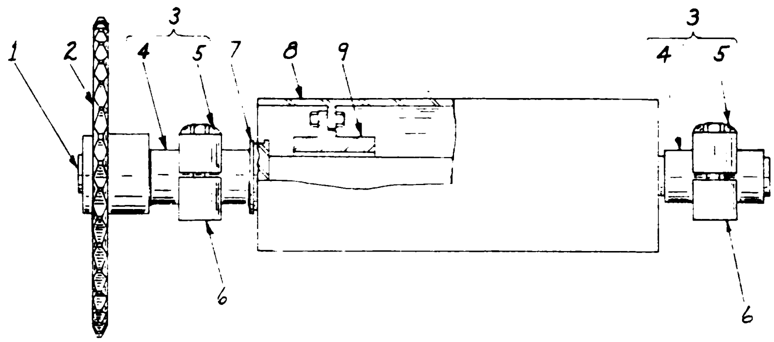


FIGURE 168

To strip the conveyor head shaft first remove it from the machine, then loosen the wired set screws from the sprocket 2, Fig. 168, so that it can be removed. Remove the ball and socket bearing 3, remove the inner set collar 7, loosen the set screws in the hubs 9, and to remove the pulley 8, from the hubs 9, remove the four bolts at each hub. In reassembling the shaft do not tighten the hubs to the pulley until the hubs have been tightened onto the shaft.

To remove the flat belt idlers 24, Fig. 167, simply remove the bolt thru the frame at each end so that it can be pulled off from the side.

To remove the foot pulley 21, first slack up on the belt, then remove the four bolts 25, Fig. 170, which hold the adjusting screws to the frame of the conveyor. Remove the bolts 26, which fasten the bearings to the pulley scraper. Foot pulley can then be removed for replacement.

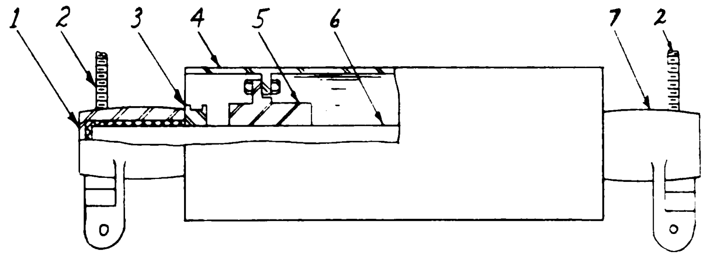


FIGURE 169

In stripping the foot pulley shaft, remove it from the machine and slide off the bearings 1 & 7, Fig. 169, remove the inner set collar 3, loosen the set screws in the pulley hub 5, finally removing the pulley 4, from the hubs 5.

In reassembling the foot pulley, tighten the pulley hub to the shaft before tightening the pulley to the hub. This will prevent misalignment.

SOIL FEEDER AND HOPPER

The upper portion of the soil hopper is supported at four points being bolted to four small upright angle legs 27, Fig. 170. For removal of this part of the hopper, remove the two bolts 28, at each leg connection.

To remove the soil feeder head shaft for replacement, break the drive chain, remove the portions of the soil conveyor skirt plate 29, Fig. 170, so that the shaft can be removed. It is necessary to break and remove the flight chain assembly 40, at the cottered coupler link so that the shaft can be then removed by removing the bearing hold-down bolts.

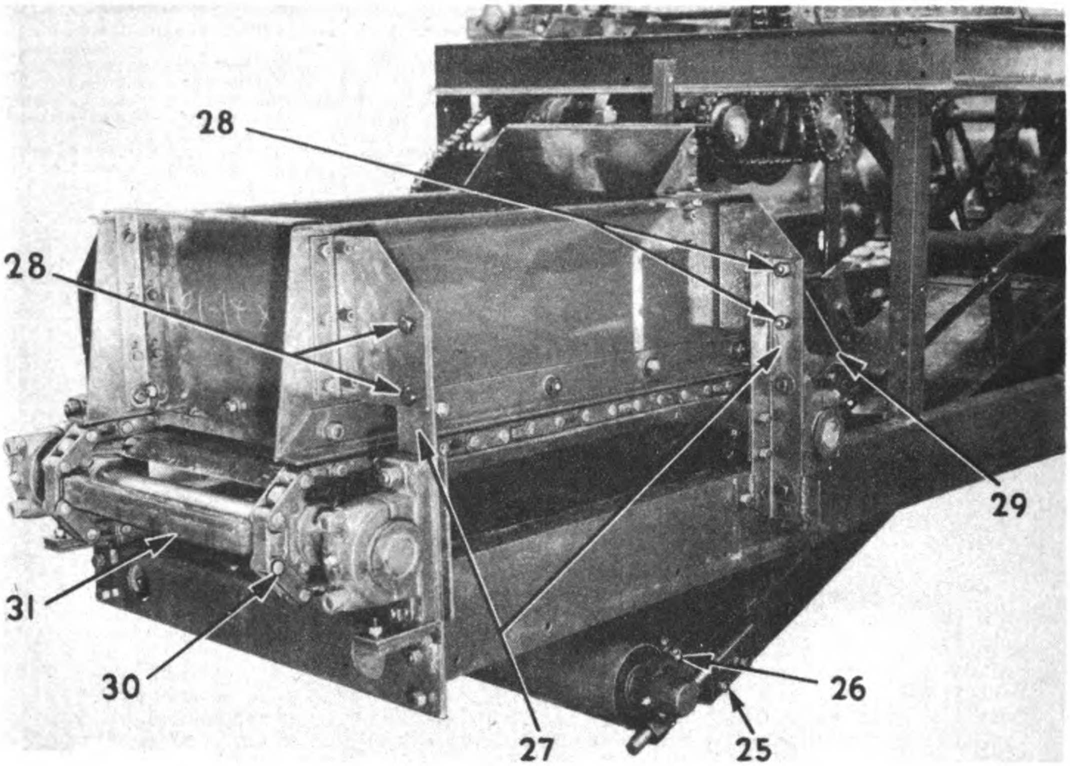


FIGURE 170

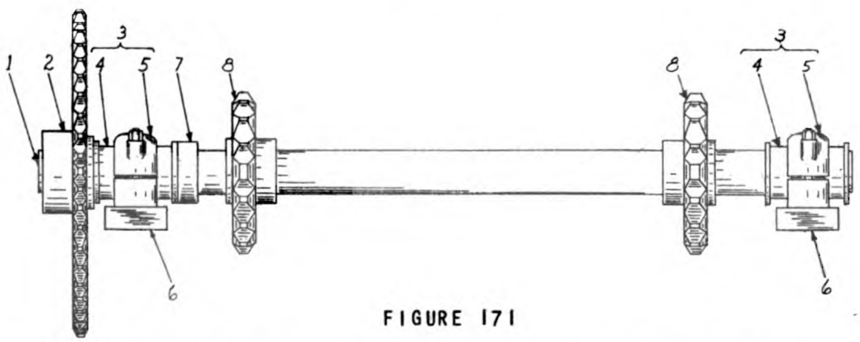


FIGURE 171

To strip the shaft for replacement of any parts, loosen the wired set screws in the sprocket 2, Fig. 171, so that it can be pulled off. Remove the two ball and socket bearings 3, loosen the wired set screws in the collar 7, and loosen the Allen type set screws in the flight chain sprockets 8, so that they can be removed. It is necessary when reassembling that all set screws fit in the spots provided on the shaft.

To remove the foot shaft, break the flight chain 30, Fig. 170, as before at the cottered coupler link. Remove the bearing and shim bolts so that the shaft can be pulled off from the rear.

To strip the shaft slide off the ball and socket bearing 2, Fig. 172, remove the set collar 6, and the flight chain sprocket 7.

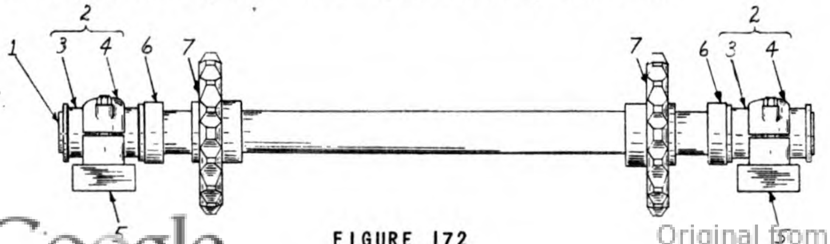


FIGURE 172

Soil Feeder Flight Line

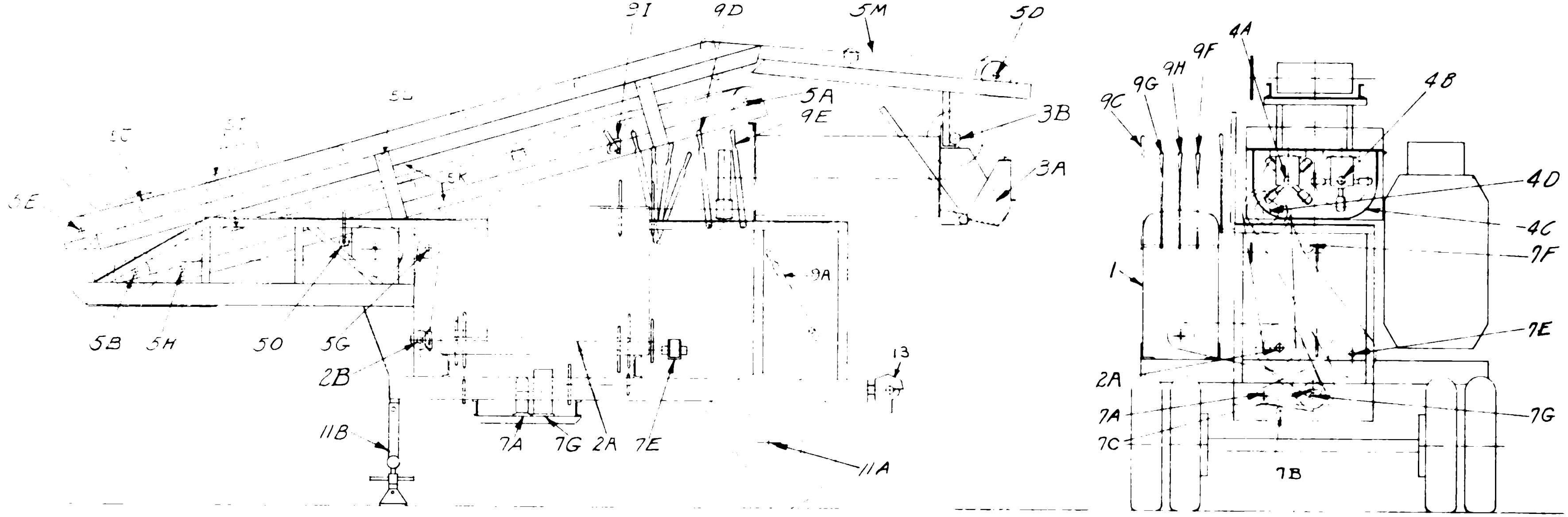
To replace flight bars 31, Fig. 170, break the chain as before and then rotate around until the desired flight bar is reached. The bars are loose in the chains, so by spreading the chains, they can be taken out and replaced.

To tighten the soil feeder flight chain, increase the distance between the head shaft and foot shaft by inserting shims between the bearing base and the bearing support of the foot shaft.

PARTS LIST

(For Accessory and Engine Parts see Accessory Section)

Barber-Greene Model 841 Mixer



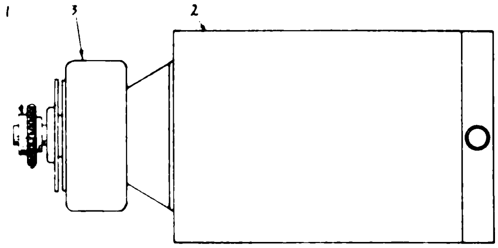
PARTS LIST
GRAPHIC INDEX

References above correspond to references in index

CONTENTS

POWER UNIT

(B/M 841-18-A)



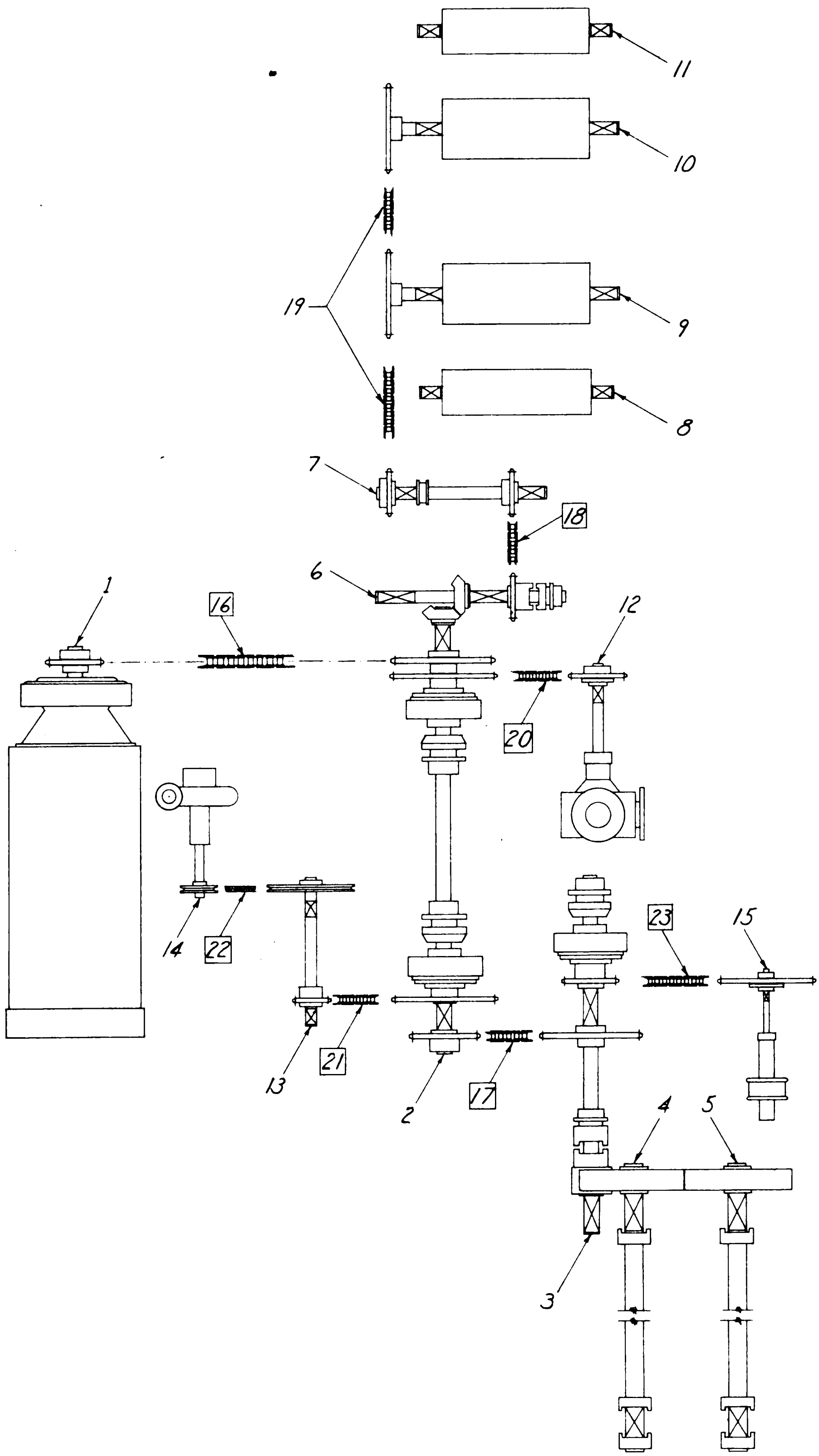
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	19-601-Y	Sprocket, 19 Tooth
	1	WW-17-33	Key, 1/2" x 1/2" x 2-15/16"
	1		Low Head Set Screw, 5/8" x 7/8"
	1		Low Head Set Screw, 5/8" x 1-1/4"
2.	1	EN-L-A11	LeRoi Power Unit D201P3 (For Details See Accessory Section)
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	4	KE-17-9	Sheared Cut Washer
	4	VV-17-109	Shim, 16 Ga.
	2	BD-17-24	Take-Up Bolt, 3/4" x 4-1/4"
	6		Half Nut, 3/4"
	4		Machine Bolt, Nut, & Lock Washer, & Two Cut Washers, 5/8" x 2"
	4		Bevel Washer, 5/8"
3.	1	SR-L-A1	Reducer & Clutch, LeRoi #2G13-33-11 for D201 Engine (For details see Accessory Section)

841 DRIVE CHAINS

See Illustration on following page.

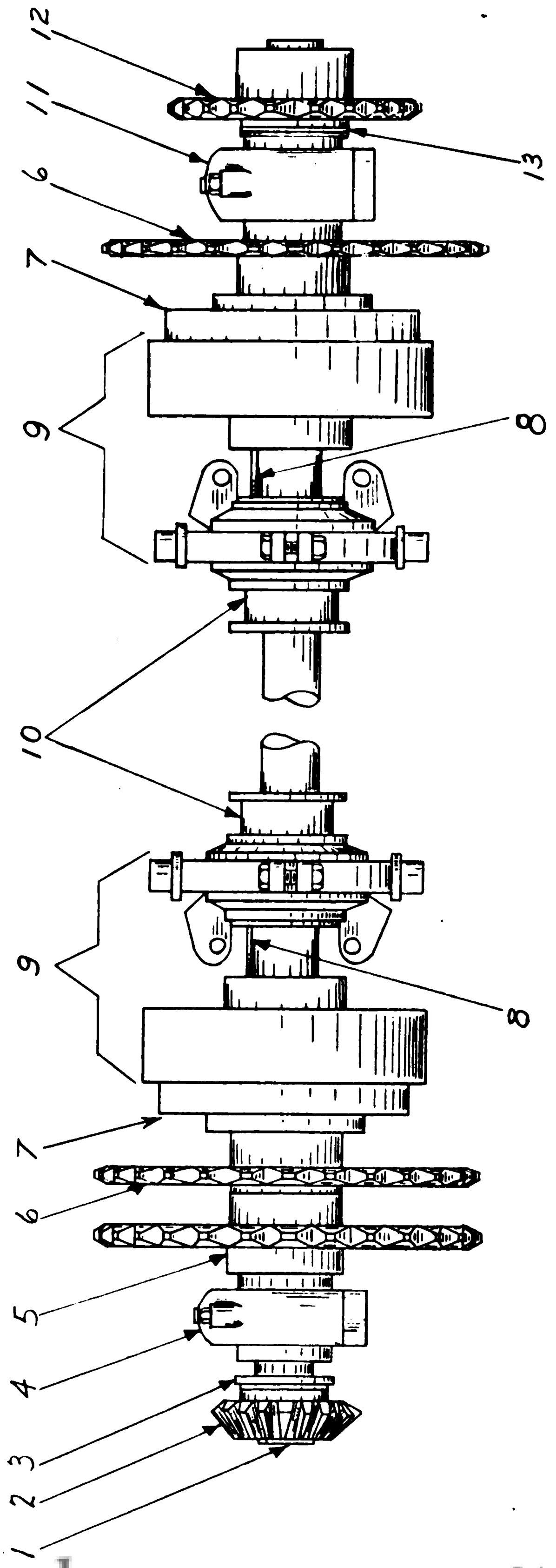
1. Engine
2. Main Jack Shaft
3. Pugmill Pinion Shaft
4. Pugmill Shaft - Engine Side
5. Pugmill Shaft - Opposite Engine Side
6. Bevel Gear Counter Shaft
7. Conveyor Drive Shaft
8. Fixed Conveyor Head Shaft
9. Fixed Conveyor Foot Shaft
10. Telescoping Conveyor Head Shaft
11. Telescoping Conveyor Foot Shaft
12. Viking Pump Shaft
13. Water Pump Counter Shaft
14. Water Pump Shaft
15. Kinney Pump Shaft

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
16.	1	AS-6-64C	Strand of Diamond #470 1-1/4" P. 68 Links
17.	1	BM-6-64C	Strand of Diamond #470 1-1/4" P. 86 Links - 1 offset
18.	1	BO-6-51R	Strand of Diamond #436 3/4" P. 88 Links - 1 offset
19.	1	IK-6-51RC	Strand of Diamond #433 3/4" P. 250 Riveted Links - 10 Cottered Links
20.	1	BJ-6-51C	Strand of Diamond #433 3/4" P. 84 Cottered Links
21.	1	BE-6-51R	Strand of Diamond #433 3/4" P. 78 Links - 1 offset
22.	1	BE-DR-C1	Dayton Cog Belt #5B4
23.	1	EQ-6-51C	Strand of Diamond #433 3/4" P. 166 Cottered Links
		A-6-64	Roller Link Diamond #470 1-1/4" P.
		B-6-64	Connecting Link Diamond #470 1-1/4" P.
		C-6-64	Offset Link Diamond #470 1-1/4" P.
		A-6-51	Roller Link Diamond #433 3/4" P.
		B-6-51	Connecting Link Diamond #433 3/4" P.
		C-6-51	Offset Link Diamond #433 3/4" P.


11
10
19
9
8
7
18
6
1
16
12
20
14
22
23
15
13
21
2
17
4
5
3

MAIN JACK SHAFT

(B/M 841-13-A1)



See Parts List on following page.

Main Jack Shaft (Continued)

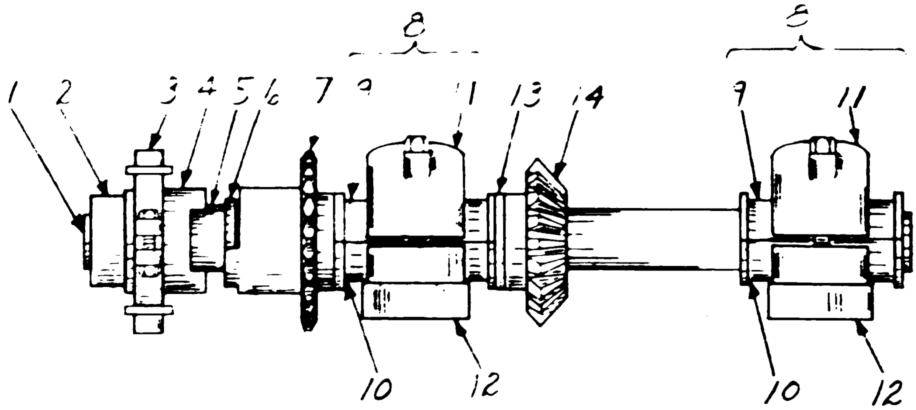
(B/M 841-13-A1)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A1-841-12	Shaft, 1-15/16" x 5' 0-9/16" S.A.E. 1045
2.	1	E-18-264	Bevel Gear, 20-Tooth
	1	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	1		Allen Cup Point Set Screw, 3/8" x 5/8"
	1		Allen Cup Point Set Screw, 3/8" x 3/8"
3.	1	C-17-189	Washer
4.	1	BR-D-D1	Bearing, Dodge-Timken PT-469
	1		1/8" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 3-1/2"
	8	DK-17-139	Shim, 20 Ga.
	10	TT-17-111	Stop Shim, 16 Ga.
	2	SS-17-111	Stop Shim, 12 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
5.	1	19-601-D	Sprocket, 33-Tooth
	1	AB-17-33	Key, 1/2" x 1/2" x 2-11/16"
	1		Set Screw, 1/2" x 7/8"
	1		Set Screw, 1/2" x 1-1/4"
6.	2	E-19-708 W	Sprocket 56-Tooth
	2	F-17-43	Pipe, 1/4" x 2"
	2		1/4" Hydraulic Alemite, Male
	4	P-8-75	Bronze Bushing
	2		Pipe Coupling, 1/4"
	2	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"
7.	2	3459 A	Clutch Drum
8.	2	AE-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
9.	2	3-1007-A	8" Friction Clutch (See Page 530 For Details)
	2		1/8" x 30° Hydraulic Alemite, Male
10.	2	136	Set Collar
	2		Low Head Set Screw, 5/8" x 7/8"
11.	1	BR-D-D2	Bearing, Dodge-Timken PT-470
	1		1/8" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 3-1/2"
	8	DK-17-139	Shim, 20 Ga.
	10	TT-17-111	Stop Shim, 16 Ga.
	2	SS-17-111	Stop Shim, 12 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
12.	1	19-601-CC	Sprocket, 22-Tooth
	1	WW-17-33	Key, 1/2" x 1/2" x 2-15/16"
13.	3	DD-17-9	Washer

Always give Serial Number of Machine, Parts Number and Description.

BEVEL GEAR COUNTER SHAFT

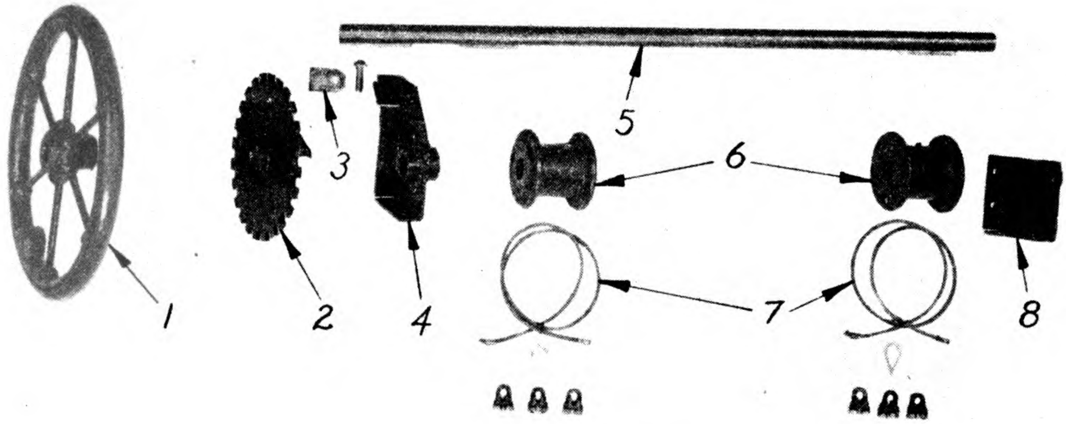
(B/M 841-14-A1)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A1-841-14	Shaft, 1-11/16" x 2' 1-11/16" S.A.E. 1045
2.	1	V-3-938	Collar
	2		Set Screw, 3/8" x 7/8"
3.	1	2438 A	Shifter Ring
	1		1/8" x 90° Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
4.	1	B-3-1166	2 Square Jaw Clutch
5.	1	AN-17-107	Feather Key, 3/8" x 3/8" x 3-3/4"
6.	1	S-3-939	Collar
7.	1	C-19-838 W	Sprocket, 23-Tooth
	1		1/4" Hydraulic Alemite, Male
	1	E-8-51	Bronze Bushing
8.	2	13-210-B	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 5-3/4"
9.	2	1312	Bearing Half
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
10.	2	1312 A	Bearing Half
11.	2	822 A	Bearing Cap
12.	2	821	Bearing Base
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3"
	16	BS-17-109	Shim, 20 Ga.
	8	SS-17-111	Stop Shim, 12 Ga.
	8	UU-17-111	Stop Shim, 20 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		Set Screw, 5/8" x 2-1/2"
	2		Half Nut, 5/8"
13.	1	J-17-164	Bronze Washer
14.	1	E-18-264	Bevel Gear, 20-Tooth
	1	A-17-32	Key, 3/8" x 3/8" x 1-7/8"

PUGMILL DISCHARGE GATE HOIST

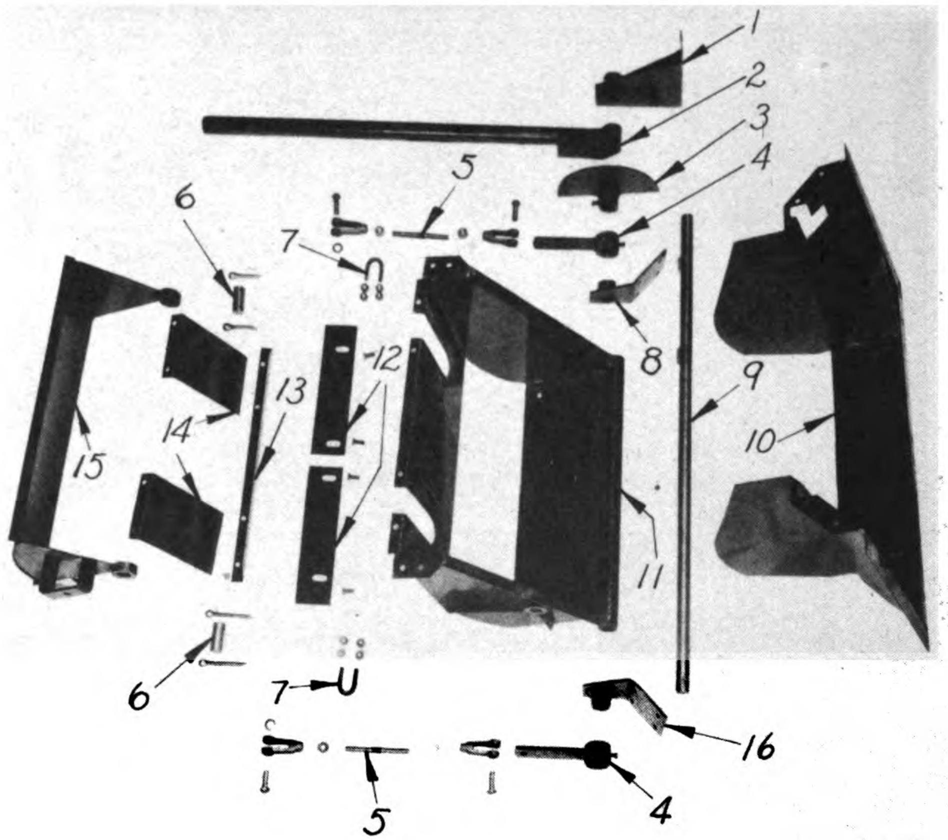
(B/M 840-70-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	1663 A	Handwheel
	2		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
	1	T-17-30	Key, 1/4" x 1/4" x 4-7/16"
2.	1	E-3-1029 W	Ratchet Wheel
	1		Set Screw, 3/8" x 1"
	1		Set Screw, 3/8" x 5/8"
3.	1	G-848-107	Stop
	1	BM-17-23	Rivet
	1		Cotter, 1/8" x 1"
4.	1	E(L) 840-70 W	Bearing Bracket
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
5.	1	A-840-70	Shaft, 1-3/16" x 3'-3 3/4", S.A.E. 1020
6.	2	111 E	Drum
	4		Allen Cup Point Safety Set Screw, 3/8" x 3/4"
	2	N-17-30	Key, 1/4" x 1/4" x 4"
7.	2		1/4" Tiller Rope x 3' 6"
	6		Cable Clamp, 1/4"
	2		Cable Thimble, 1/4"
8.	1	C (L) 840-70 W	Bearing Bracket
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"

Always give Serial Number of Machine, Parts Number and Description.

PUGMILL DISCHARGE GATE
(B/M 840-73-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	CC-840-75 W	Bearing Bracket
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
2.	1	V-840-75 W	Lever
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
3.	1	X-840-75 W	Lever Arm
	1		Set Screw, 3/8" x 1/2"
	1		Set Screw, 3/8" x 3/4"
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
4.	2	J-3-1032 W	Lever Arm
	4		Set Screw, 3/8" x 3/4"
	2	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
5.	2	AD-17-144	Shifter Rod
	4		Hex Nut, 1/2"
	4	A-3-604	Yoke End
	4	CP-17-23	Rivet
	2	HH-17-9	Washer
	4		Cotter, 1/8" x 1"

Pugmill Discharge Gate (Continued)
(B/M 840-73-A)

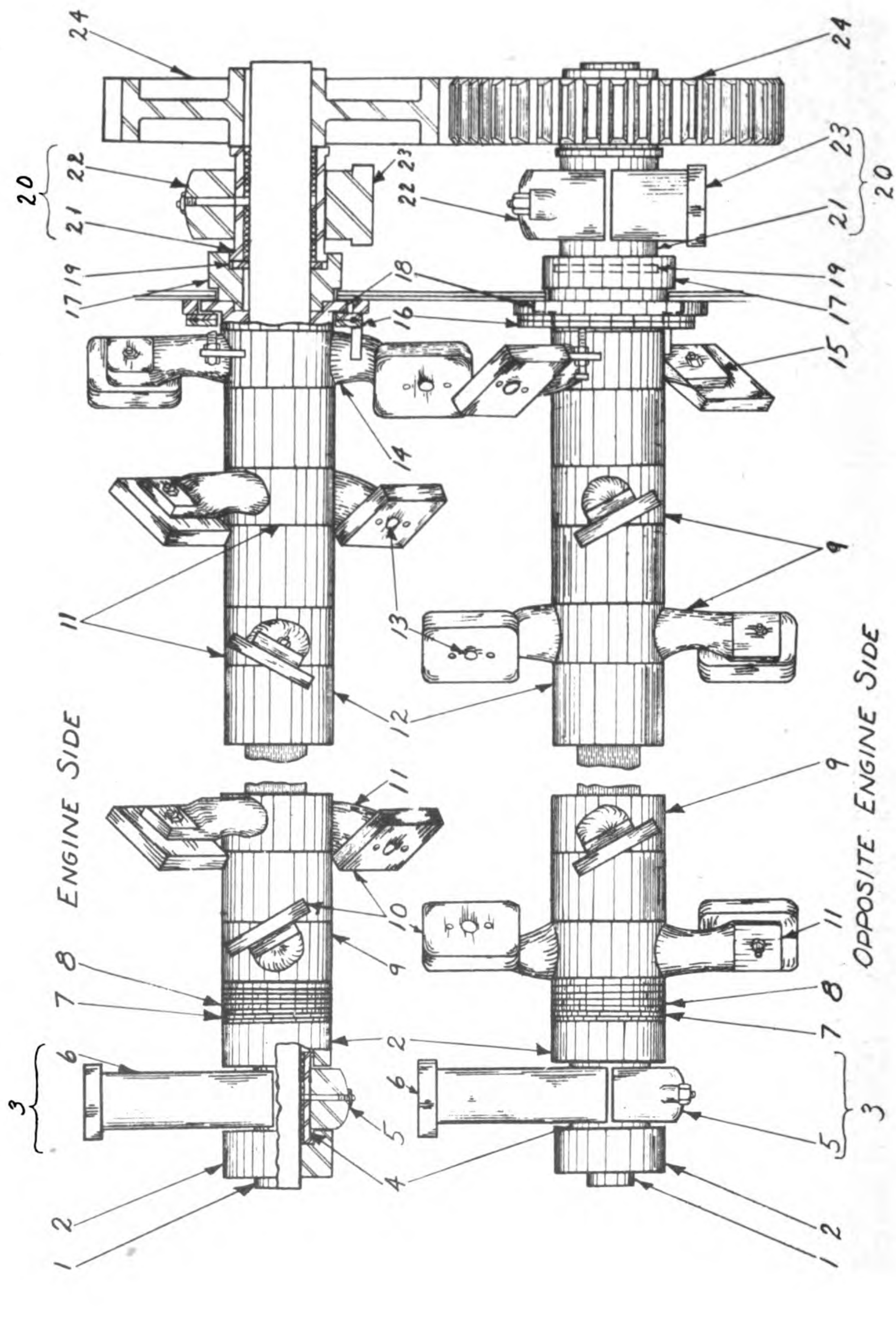
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	2	JG-17-25	Shaft, 1" x 2-3/8" S.A.E. 1020
	2		Cotter, 3/8" x 2"
	2		Cotter, 3/8" x 3"
7.	2	B-46-36	U-Bolt, 3/8"
	8		Hex Nut, 3/8"
8.	1	F (L) 840-75 W	Bearing Bracket
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	2		Hex Head Cap Screw, & Lock Washer, 3/8" x 1"
9.	1	Z-840-75	Shaft, 1-3/16" x 3' 7-1/8" S.A.E. 1045
10.	1	D-840-75 W	Chute
	4		Cut Washer, 3/8"
	8		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
11.	1	N-840-75 W	Chute End Gate
12.	2	DD-840-75	Scraper
	4		Flat Head Cap Screw, Nut, & Lock Washer, & Cut Washer, 3/8" x 1"
13.	1	EE-840-75	Angle
	4		Machine Bolt, Nut, Lock Washer, 3/8" x 3/4"
14.	2	FF-840-75	Filler Plate
15.	1	S-840-75W	Chute Cut Off Gate
16.	1	F (R) 840-75 W	Bearing Bracket
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	2		Hex Head Cap Screw, & Lock Washer, 3/8" x 1"

PUGMILL PADDLE SHAFT (Engine Side)
(B/M 840-12-C)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A1-840-12	Shaft, 2-1/2" x 2-1/2" x 5'-5", S.A.E. 1045
2.	2	A-3-1150	Seals
	4		Set Screw, 1/2" x 1-1/2"
3.	1	13-213-0	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 5/8" x 5-1/2"
4.	1	2419C	Bearing
	2	S-8-75	Bronze Bushing
	1	KK-17-43	Pipe, 1/4" x 6-1/2"
	1		Elbow, 1/4" x 90°
	1		1/4" & 30° Hydraulic Alemite, Male

Pugmill Paddle Shaft (Continued)



Pugmill Paddle Shaft (Engine Side) (Continued)

(B/M 840-12-C)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5.	1	822	Bearing Cap
6.	1	3701	Bearing Base
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 2-1/2"
	1	P-17-165	Shim, 16 Ga.
	1	Q-17-165	Shim, 12 Ga.
	1	S-17-165	Shim, 1/4" Plate
	2	QQ-17-111	Shim, 1/4" Plate
	2	SS-17-111	Shim, 12 Ga.
	2	TT-17-111	Shim, 16 Ga.
	4	UU-17-111	Shim, 20 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
7.	3	C-840-12	Spacer
8.	3	D-840-12	Spacer
9.	1	3704	Paddle Arm
10.	16	A-3-1149	Paddle Tips
11.	6	3703	Paddle Arm
12.	7	B-3-1150	Pipe Spacer
13.	16	D-3-475	#3 Head Plow Bolt, Nut, & Lock Washer, 5/8" x 2"
14.	1	C-3-1149 W	Paddle Arm
16.	1	A-840-11 W	Ring
	2		Set Screw, 1/2" x 1-3/4"
	2		Hex Nut, 1/2"
	2		Half Nut, 1/2"
17.	1	D-3-1150	Outer Seal
	1	UU-17-34	Key, 5/8" x 5/8" x 1-5/8"
18.	1	3702	Inner Seal
19.	1	A-17-189	Bronze Washer
20.	1	13-219-D	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 3/4" x 7"
21.	1	3600	Bearing
	2	JJ-8-95	Bronze Bushing
	1	X-17-43	Pipe, 1/4" x 7"
	1		Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
22.	1	3105	Bearing Cap
23.	1	3104	Bearing Base
	2		Machine Bolt, Nut, & Lock Washer, 3/4" x 2-1/2"
	1	G-17-139	Shim, 24 Ga.
	3	E-17-139	Shim, 16 Ga.
	1	F-17-39	Shim, 20 Ga.
	1	QQ-17-111	Shim, 1/4" Plate
	1	SS-17-111	Shim, 12 Ga.
	1	TT-17-111	Shim, 16 Ga.
	2	UU-17-111	Shim, 20 Ga.
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
	1	F-17-111	Stop Shim, 1/4" x 1-1/2" Bar
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
24.	1	A1-18-266	Gear, 42-Tooth
	1	DD-17-34	Key, 5/8" x 5/8" x 3-1/4"
	2		Set Screw, 5/8" x 1-1/2"

PUGMILL PADDLE SHAFT (Opposite Engine Side)

(B/M 840-12-D)

See Illustration on page 412

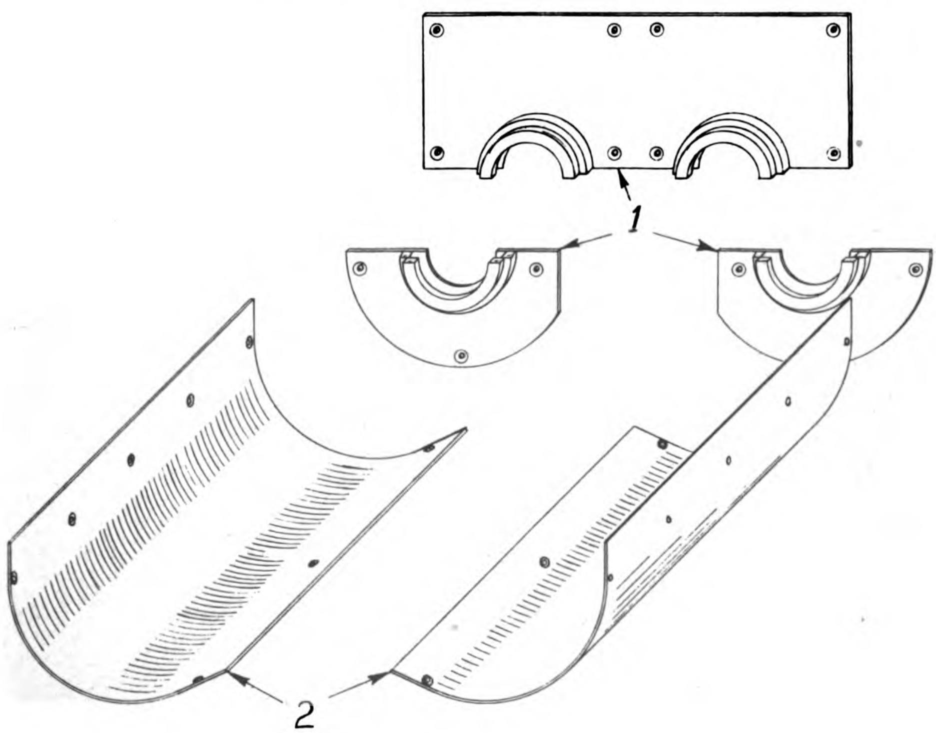
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A1-840-12	Shaft, 2-1/2" x 2-1/2" x 5' 5", S.A.E. 1045
2.	2	A-3-1150	Seals
	4		Set Screw, 1/2" x 1-1/2"
3.	1	13-213-0	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 5/8" x 5-1/2"
4.	1	2419 C	Bearing
	2	S-8-75	Bronze Bushing
	1	KK-17-43	Pipe, 1/4" x 6-1/2"
	3		Elbow, 1/4" x 90°
	1		1/4" x 30° Hydraulic Alemite, Male
5.	1	822	Bearing Cap
6.	1	3701	Bearing Base
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 2-1/2"
	1	P-17-165	Shim, 16 Ga.
	1	Q-17-165	Shim, 12 Ga.
	1	S-17-165	Shim, 1/4" Plate
	2	QQ-17-111	Shim, 1/4" Plate
	2	SS-17-111	Shim, 12 Ga.
	2	TT-17-111	Shim, 16 Ga.
	4	UU-17-111	Shim, 20 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
7.	3	C-840-12	Spacer
8.	3	D-840-12	Spacer
9.	6	3704	Paddle Arm
10.	16	A-3-1149	Paddle Tip
11.	1	3703	Paddle Arm
12.	7	B-3-1150	Pipe Spacer
13.	16	D-3-475	#3 Head Plow Bolt, Nut, & Lock Washer, 5/8" x 2"
15.	1	D-3-1149 W	Paddle Arm
16.	1	A-840-11 W	Ring
	2		Set Screw, 1/2" x 1-3/4"
	2		Hex Nut, 1/2"
	2		Half Nut, 1/2"
17.	1	D-3-1150	Outer Seal
	1	UU-17-34	Key, 5/8" x 5/8" x 1-5/8"
18.	1	3702	Inner Seal
19.	1	A-17-189	Bronze Washer
20.	1	13-219-D	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 3/4" x 7"
21.	1	3600	Bearing
	2	JJ-8-95	Bronze Bushing
	1		1/4" Hydraulic Alemite, Male

Pugmill Paddle Shaft (Opposite Engine Side) (Continued)
(B/M 840-12-D)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
22.	1	3105	Bearing Cap
23.	1	3104	Bearing Base
	2		Machine Bolt, Nut, & Lock Washer, 3/4" x 2-1/2"
	1	G-17-139	Shim, 24 Ga.
	3	E-17-139	Shim, 16 Ga.
	1	F-17-139	Shim, 20 Ga.
	1	QQ-17-111	Shim, 1/4" Plate
	1	SS-17-111	Shim, 12 Ga.
	1	TT-17-111	Shim, 16 Ga.
	2	UU-17-111	Shim, 20 Ga.
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
	1	F-17-111	Stop Shim, 1/4" x 1-1/2" Bar
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	1	M-17-71	Stop Shim, 1/4" x 1-1/2" Bar
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
24.	1	A1-18-266	Gear, 42-Tooth
	1	DD-17-34	Key, 5/8" x 5/8" x 3-1/4"
	2		Set Screw, 5/8" x 1-1/2"

PUGMILL LINER PLATES
(B/M 840-20-A1)

See Parts List on following page.



Pugmill Liner Plates (Continued)

(B/M 840-20-A1)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	E-840-24 W	Liner Plate
	14		Plow Bolt, Nut, Lock Washer, & Cut Washer, 1/2" x 1-1/4", #3 Head
2.	2	A-840-24	Liner Plate
	16		Plow Bolt, Nut, & Lock Washer, 1/2" x 1-1/2", #3 Head
	12		Cut Washer, 1/2"

PUGMILL PINION SHAFT

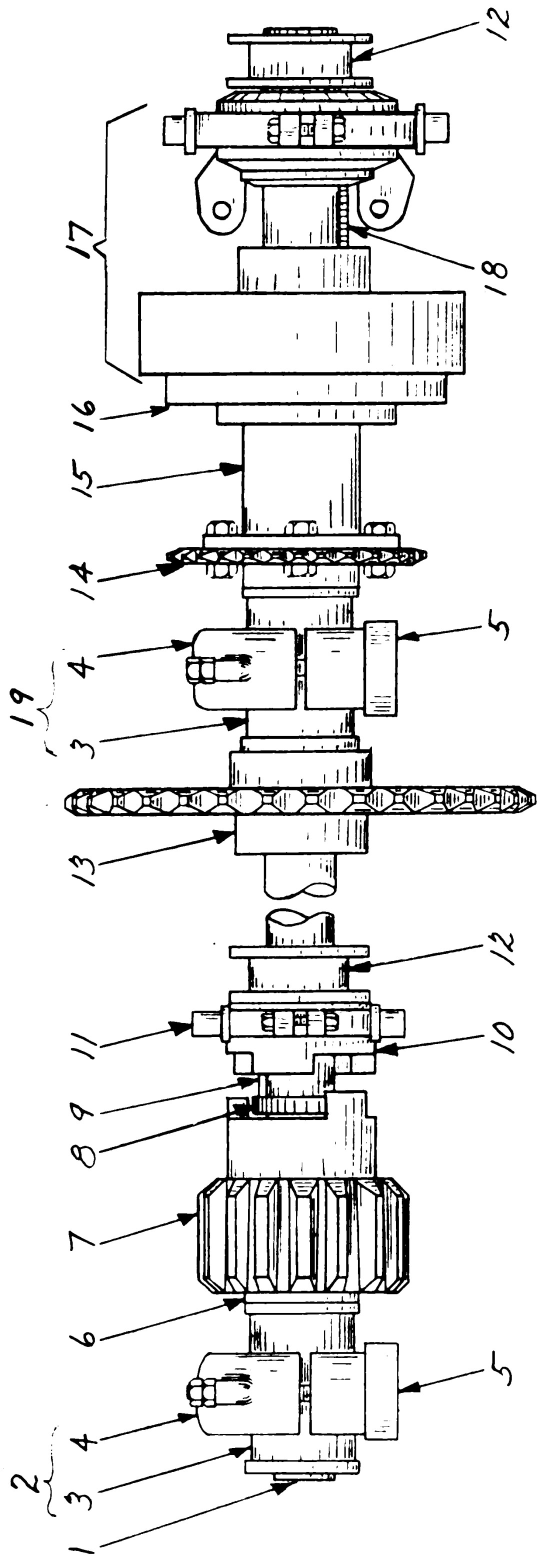
(B/M 841-11-A)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-11	Shaft, 1-15/16" x 3' 11-9/16" S.A.E. 4140
2. & 19.	2	13-213-P	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/4"
3.	2	3705	Bearing
	2	M-8-75	Bronze Bushing
	2		1/4" Hydraulic Alemite, Male
	1	K-17-43	Pipe, 1/4" x 6" (For #2)
	1		Elbow, 1/4" x 90° (For #2)
	2	G-17-43	Pipe, 1/4" x 2-1/4" (For #19)
	2		Pipe Coupling, 1/4"
4.	2	822 B	Bearing Cap
5.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	6	TT-17-111	Stop Shim, 16 Ga.
	3	UU-17-111	Stop Shim, 12 Ga.
	3	QQ-17-111	Stop Shim, 1/4" x 2-1/2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	4		Machine Bolt, Nut & Jam Nut 5/8" x 6"
6.	1	V-17-9	Washer
7.	1	B-18-266	Pinion, 16-Tooth
	2	H-8-74	Bronze Bushing
	1		1/4" Hydraulic Alemite, Male
8.	1	E-3-941	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 1/2"
9.	1	Y-17-106	Feather Key, 1/2" x 1/2" x 4"
10.	1	2864	3 Jaw Square Clutch
11.	1	2427	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
	1		1/4" Hydraulic Alemite, Male
12.	2	136	Set Collar
	4		Low Head Set Screw, 5/8" x 7/8"

Pugmill Pinion Shaft (Continued)

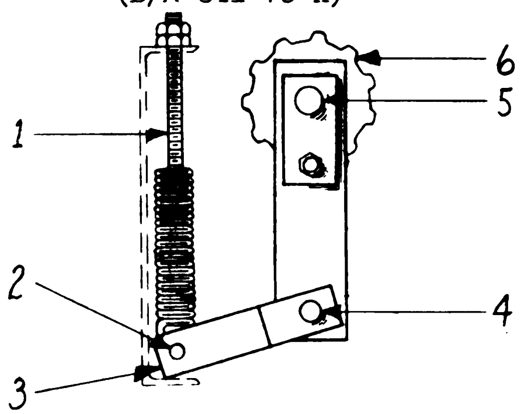
(B/M 841-11-A)



Pugmill Pinion Shaft (Continued)
(B/M 841-11-A)

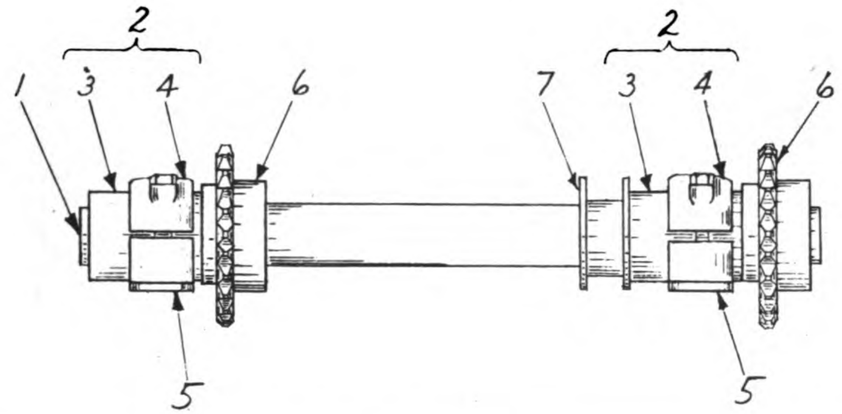
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
13.	1	19-601-D	Sprocket, 33-Tooth
	1	U-17-33	Key, 1/2" x 1/2" x 2-3/4"
	1		Set Screw, 1/2" x 7/8"
	1		Set Screw, 1/2" x 1-1/4"
14.	1	A-19-792	Sprocket, 29-Tooth Change Sprockets
14.	1	B-19-792	Sprocket, 47-Tooth Change Sprockets
	6		Cap Screw, Nut, & Lock Washer, 1/2" x 1-1/2", S.A.E. Thread
15.	1	A-3-1192 W	Hub (Includes Bushings)
	1	A-8-75	Bushing
	1	H-8-75	Bushing
	1	F-17-43	Pipe, 1/4" x 2"
	1		Pipe Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
	1	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"
16.	1	3459 B	Clutch Drum
17.	1	3-1007-A	8" Friction Clutch (See Page 530 For Details)
	1		1/8" x 90° Hydraulic Alemite, Male
18.	1	AE-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"

PUGMILL DRIVE IDLER
(B/M 841-75-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B1-46-87	Extension Spring & Bolt
	2		1/2" Hex Nut
2.	1	O-17-23	Rivet
	1		Cotter, 1/8" x 1"
3.	1	A-841-75 W	Idler Bracket
4.	1	JW-17-25	Shaft, 3/4" x 6", S.A.E. 1020
	2		Cotter, 3/16" x 1-1/4"
	4		Cut Washer, 3/4"
5.	1	H-841-75 W	Keeper Shaft
	1		Street Elbow, 1/8" x 90°
	1		1/8" Hydraulic Alemite, Male
	1		Cotter, 1/4" x 2"
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
6.	1	F-19-357	Sprocket, 11-Tooth
	2	D-8-35	Bronze Bushing

CONVEYOR DRIVE INTERMEDIATE SHAFT
(B/M 841-181-A)

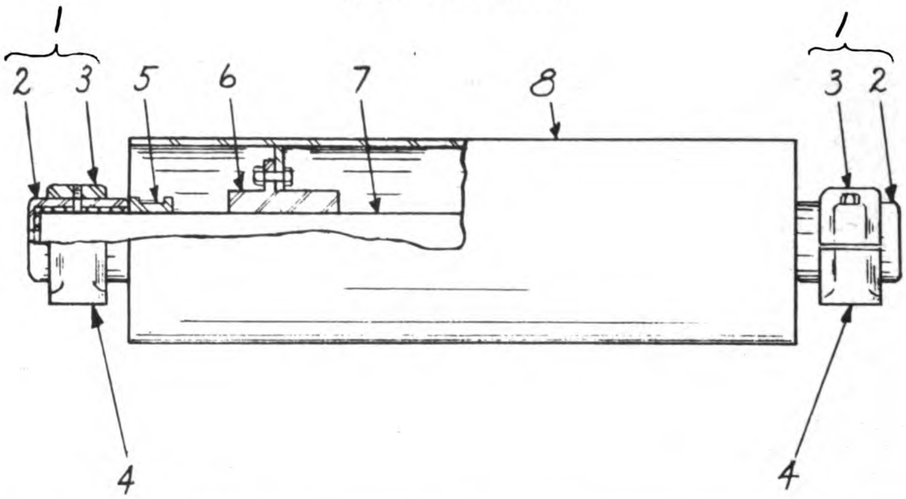


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-181	Shaft, 1-11/16" x 1' 11" S.A.E. 1045
2.	2	13-211-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, Lock Washer, & Cut Washer, 1/2" x 4-1/2"
3.	2	2806	Bearing (Babbitted)
	2	A-13-50	Special Grease Pipe
	2		1/8" Hydraulic Alemite, Male
4.	2	3331	Bearing Cap
5.	2	3341	Bearing Base
	4	BA-17-109	Shim, 16 Ga.
	4	BC-17-109	Shim, 12 Ga.
	2	BD-17-109	Shim, 1/4" Plate
	8	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
6.	2	19-458-CC	Sprocket, 23-Tooth
	2	C-17-32	Key, 3/8" x 3/8" x 2-1/16"
	2		Set Screw, 1/2" x 1"
	2		Set Screw, 1/2" x 1-1/4"
7.	1	183	Set Collar
	1		Low Head Set Screw, 1/2" x 5/8"

Always give Serial Number of Machine, Parts Number and Description.

TELESCOPING CONVEYOR FOOT SHAFT

(B/M 841-35-A)

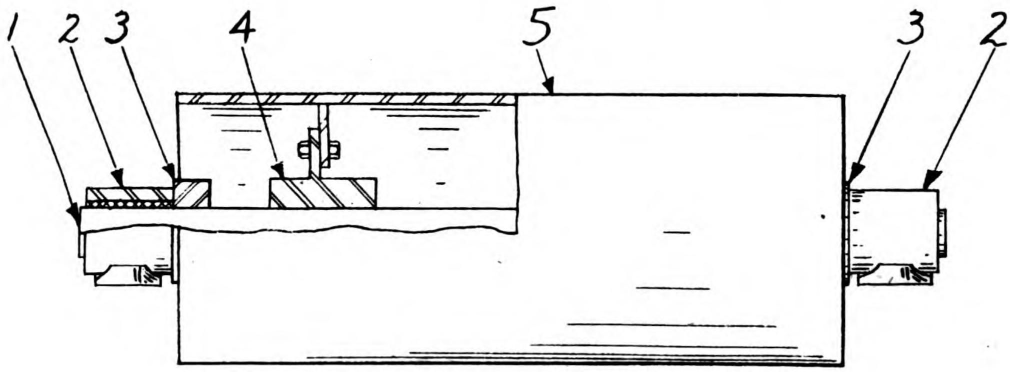


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	13-229-A	Ball & Socket Bearing (Complete)
	4		Flat Head Cap Screw, Nut, & Lock Washer, 1/2" x 4-1/2"
2.	2	1308	Bearing (Babbitted)
	2	A-13-45	Pipe, 1/4" x 1"
	2		1/8" x 30 Hydraulic Alemite, Male
3.	2	1307	Bearing Cap
4.	2	1306	Bearing Base
5.	2	A-3-2	Collar, 1-7/16" St'd
	2		Set Screw, 3/8" x 3/4"
6.	2	A-46-233	Hub
	4		Set Screw, 3/8" x 1-1/4"
7.	1	A-841-35	Shaft, 1-7/16" x 2' 1-3/4" S.A.E. 1020
8.	1	M-46-230	Pulley

FIXED CONVEYOR HEAD SHAFT

(B/M 841-27-A)

See Parts List on following page.



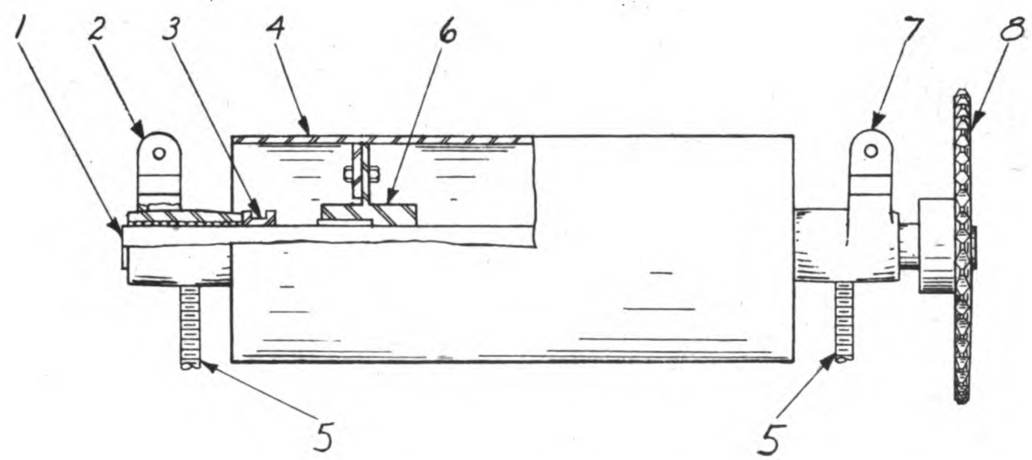
Fixed Conveyor Head Shaft (Continued)

(B/M 841-27-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-27	Shaft, 1-7/16" x 2' 2", S.A.E. 1020
2.	2	175	Bearing
	2		1/4" Hydraulic Alemite, Male
	2	M-17-28	Stop, 1/4" x 2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 1-3/4"
3.	2	K-3-935	Collar
4.	2	A-46-233	Hub
	4		Set Screw, 3/8" x 1-1/4"
5.	1	M-46-230	Pulley

TELESCOPING CONVEYOR HEAD SHAFT

(B/M 841-26-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-26	Shaft, 1-7/16" x 2' 6-1/2", S.A.E. 1045
2.	1	2273-B	Take-Up Bearing
	1		1/8" x 30° Hydraulic Alemite, Male
	1		Reducing Bushing, 1/4" to 1/8"
3.	2	K-3-935	Collar
	2		Set Screw, 1/2" x 3/4"
4.	1	M-46-230	Pulley
5.	2	B-841-26 W	Take Up Screw
	2	BU-17-24	Hex Nuts & Lock Washer, 1-1/4"
	2	M-17-28	Stop Shim, 1/4" x 2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
6.	2	A-46-233	Hub
	2	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	2		Set Screw, 3/8" x 1-1/4"
	2		Set Screw, 3/8" x 1"

Telescoping Conveyor Head Shaft (Continued)

(B/M 841-26-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
7.	1	2274-B	Take Up Bearing
	1		1/8" x 30° Hydraulic Alemite, Male
	1		Reducing Bushing, 1/4" to 1/8"
8.	1	19-458-P	Sprocket, 46-Tooth
	1	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
	1	C-17-43	1/4" Pipe Nipple x 7/8"

FIXED CONVEYOR FOOT SHAFT

(B/M 841-26-A)

See Illustration on page 420

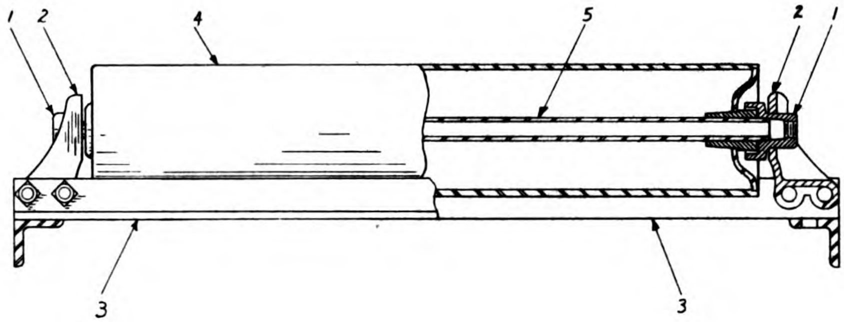
REF.NO.	NO.REQ	PART NO.	DESCRIPTION
1.	1	A-841-26	Shaft, 1-7/16" x 2' 6-1/2", S.A.E. 1045
2.	1	2273-B	Take Up Bearing
	1		1/8" x 90° Hydraulic Alemite, Male
	1		Reducing Bushing, 1/4" to 1/8"
3.	2	K-3-935	Collar
	2		Set Screw, 1/2" x 3/4"
4.	1	M-46-230	Pulley
5.	2	B-841-26 W	Take Up Screw
	2	BU-17-24	Hex Nut
	2	M-17-28	Stop Shim, 1/4" x 2"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
6.	2	A-46-233	Hub
	2	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	2		Set Screw, 3/8" x 1-1/4"
	2		Set Screw, 3/8" x 1"
7.	1	2274 B	Take Up Bearing
	1		1/4" Hydraulic Alemite, Male
	1	C-17-43	Pipe, 1/4" x 7/8"
	1		Elbow, 1/4" x 45°
8.	1	19-458-P	Sprocket, 46-Tooth
	1	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"

Always give Serial Number of Machine, Parts Number and Description.

18" FLAT CARRIER

(B/M 14-54-B)

NOTE: One required on Machine



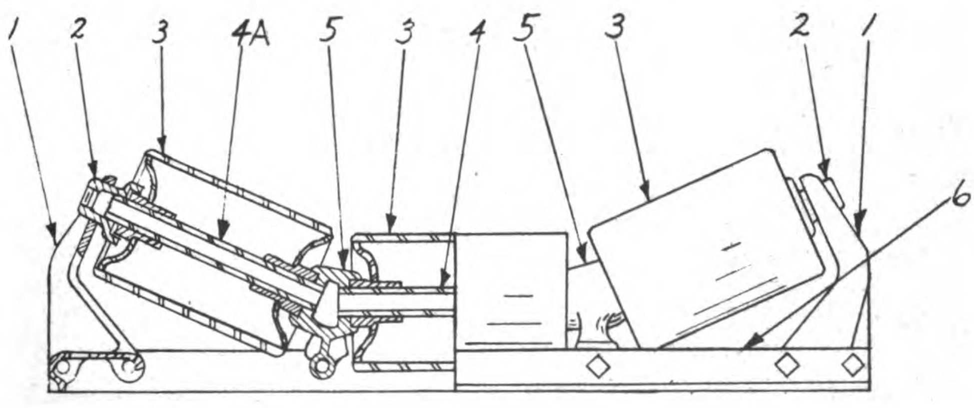
REF.NO:	NO.REQ.	PART NO.	DESCRIPTION
1.	2	760	Pipe Cap
	2		1/4" Hydraulic Alemite, Male
2.	2	747	End Stand
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 4-3/4"
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
3.	2	A-14-54	Side Angle
4.	1	G-14-172 M	Roller
5.	1	C-14-57	Roll Shaft

18" TROUGHING CARRIER

(B/M 14-56-B)

NOTE: Ten required on Machine

See Parts List on following page.



18" Troughing Carrier (Continued)

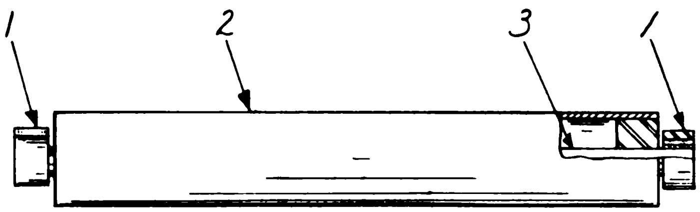
(B/M 14-56-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	617	End Bracket
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 5"
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
2.	2	760	Dust Cap
	2		1/4" Hydraulic Alemite, Male
3.	3	E-14-172 M	Roll
4.	1	C-14-56	Roll Shaft
4A.	2	H-14-56	Roll Shaft
5.	2	759	Center Bracket
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 5"
6.	2	A-14-56	Carrier Base

CONVEYOR RETURN ROLL

(B/M 841-28-A)

NOTE: Three required on Machine



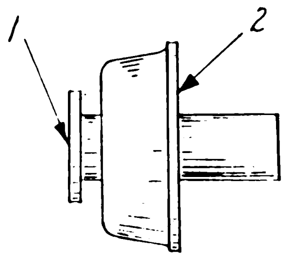
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	A-13-271 W	Bearings
	2		1/8" Hydraulic Alemite, Male
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 3/8" x 3/4"
	2	B-8-123	Bronze Bushing
2.	1	A-841-28 W	Roller
	2		Allen Cup Point Safety Set Screw, 1/2" x 7/8"
3.	1	D-841-28	Shaft, 3/4" x 1' 8-3/4", S.A.E. 1020

Always give Serial Number of Machine, Parts Number and Description.

CONVEYOR SUPPORT ROLLER

(B/M 841-50-A)

NOTE: Six required on Machine



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-841-50 W	Roller Shaft
	1		1/8" Hydraulic Alemite, Male
2.	1	B-3-1195	Roller

CONVEYOR BELTS

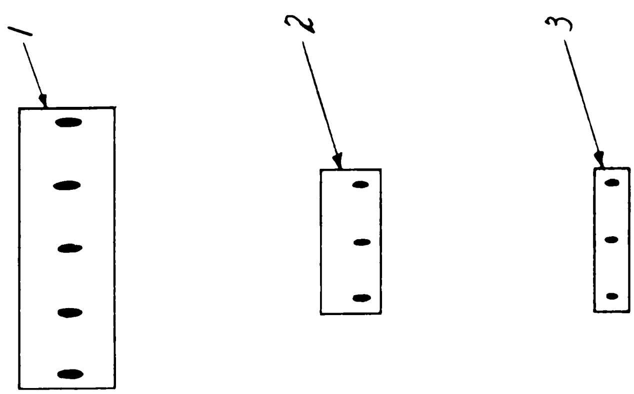
(B/M 841-160-B)
(B/M 841-162-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1		18" Hot Material Belt x 29' 7" For Fixed Conveyor
	1		18" Hot Material Belt x 43' 3" For Telescoping Conveyor
	4		#45 Alligator Lacing x 18"
	4		#45 Rocker Pins x 18"

CONVEYOR SCRAPERS

(B/M 841-27-B)
(B/M 841-27-A)
(B/M 841-26-A)

See Parts List on following page.



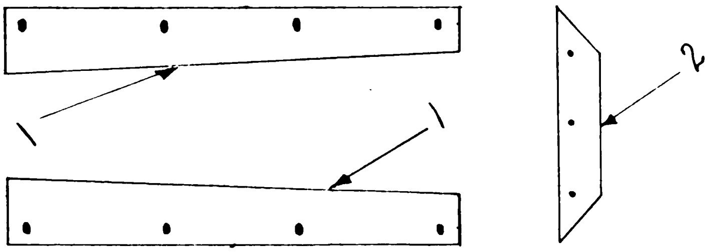
Conveyor Scrapers (Continued)

(B/M 841-27-B)
(B/M 841-27-A)
(B/M 841-26-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-841-27	4 PLY Belt Flashing 7" x 1' 8" (For Fixed Conveyor Belt Scraper)
	5		Round Head Stove Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
2.	2	D-841-27	Scraper For Fixed Conveyor Head Pulley
	6		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1"
3.	6	E-841-26	Scraper for other pulleys.
	18		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"

FIXED CONVEYOR DISCHARGE CONCENTRATOR FLASHING

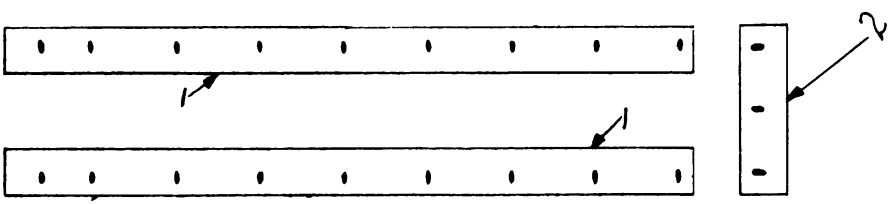
(B/M 841-158-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	A-841-158	4 PLY Belt Flashing, 5" x 2' 8-1/4"
	8		Machine Bolt, Nut, Lock Washer, 3/8" x 1-1/4"
2.	1	K-841-158	4 PLY Belt Flashing, 3-1/8" x 1' 5"
	3		Machine Bolt, Nut, Lock Washer, 3/8" x 1-1/4"

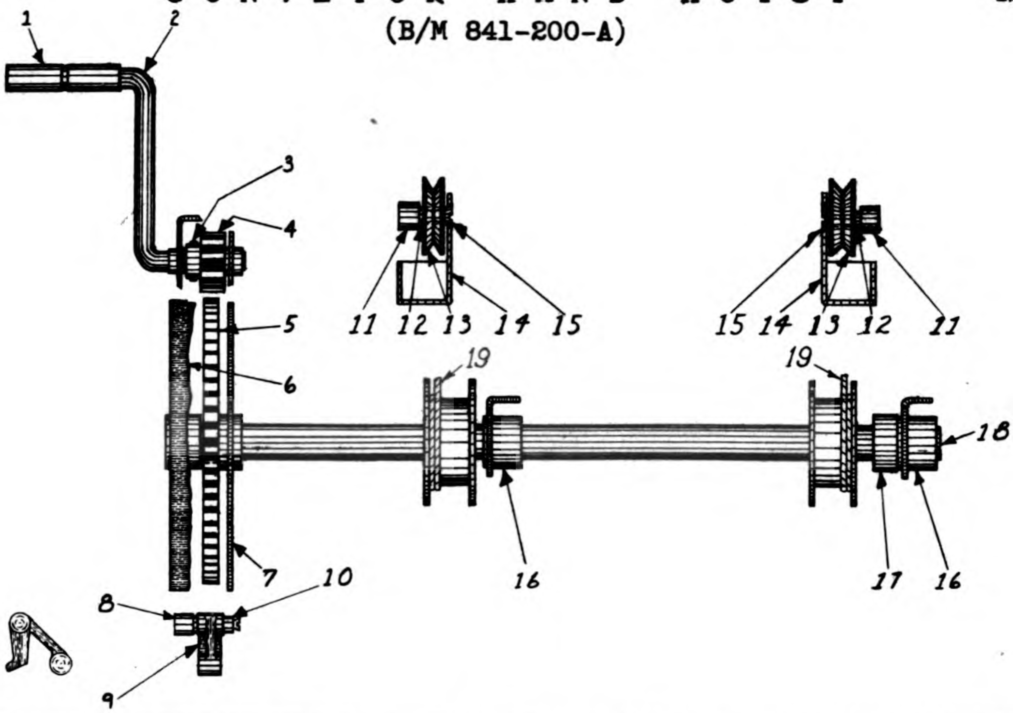
TELESCOPING CONVEYOR HOPPER FLASHING

(B/M 841-94-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	C-841-93	4 PLY Belt Flashing, 3-1/4" x 4' 1-1/2"
	18		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
2.	1	E-841-93	4 PLY Belt Flashing 3-1/2" x 1' 0-1/4"
	3		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"

CONVEYOR HAND HOIST
(B/M 841-200-A)

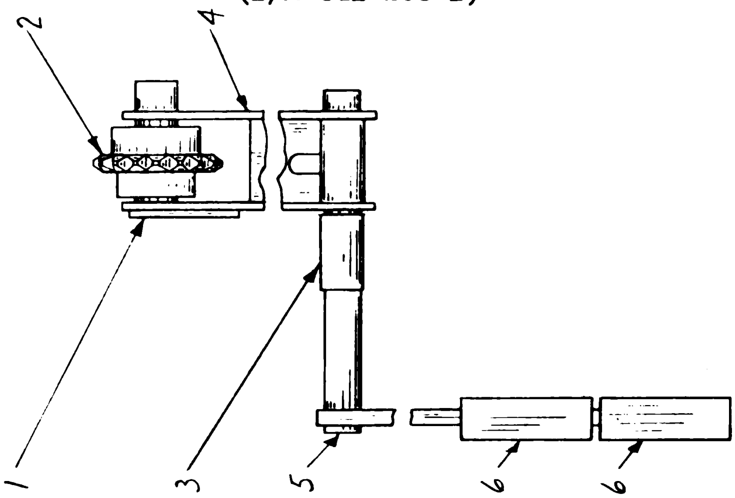


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	C-841-202	Tubing
2.	1	B-841-202	Crank
3.	1	P-17-26	Rod
4.	1	E-18-204	Pinion, 10-Tooth
5.	1	18-258-E	Gear, 58-Tooth
	1	B-17-32	Key, 3/8" x 3/8" x 2"
	1		Allen Cup Point Safety Set Screw, 1/2" x 3/4"
	1		Allen Cup Point Safety Set Screw, 1/2" x 1"
6.	1	A-841-201 W	Housing
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1"
	1		Flat Head Cap Screw, Nut, & Lock Washer, 1/2" x 1"
	1		1/8" Hydraulic Alemite, Male
7.	1	F-841-201 W	Hoist Plate
8.	1	O-17-12	Pipe Spacer
9.	1	#1744 A	Pawl
10.	1	ZZ-17-10	Pipe Spacer
	1		Flat Head Cap Screw Nut, & Lock Washer, 1/2" x 3-1/2"
11.	2	V-17-13	Pipe Spacer
12.	2	H-17-116	Bushing
13.	2	#992 C	Sheave
14.	1	M(R) 841-201 W	Sheave Bracket (Operator's Side)
	1	M(L) 841-201 W	Sheave Bracket (opposite Operator's Side)
	2		Machine Bolt, Nut, Lock Washer, 1/2" x 1"
	4		Machine Bolt, Nut, Lock Washer, 1/2" x 1-1/2"
15.	2	A-17-83	Special Flat Head Cap Screw
	4		Half Hex Nut, 3/4"
	2		1/8" Hydraulic Alemite, Male

Conveyor Hand Hoist (Continued)
(B/M 841-200-A)

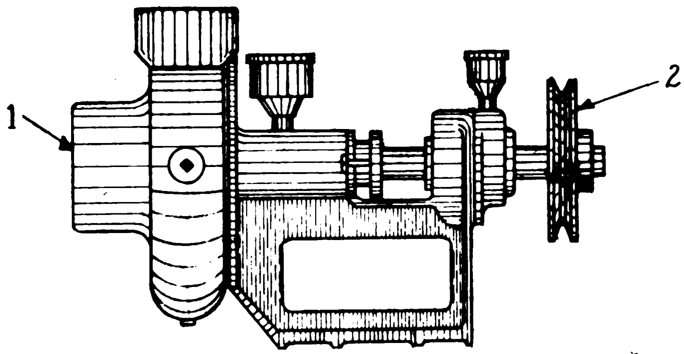
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
16.	1	J-841-201 W	Bearing Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	12		Cut Washer. 1/2"
	1		1/8" x 30° Hydraulic Alemite, Male
	1		1/8" Hydraulic Alemite, Male
	2		Street Elbow, 1/8" x 90°
	1	J-17-119	Pipe, 1/8" x 9"
	1		Pipe Coupling, 1/8"
17.	1	V-3-938	Collar
18.	1	F-841-202 W	Drum Shaft with Drums
19.	1		Cable, 1/4" x 58' 8"
	2		Cable Clamps, 1/4"

CONVEYOR DRIVE IDLER
(B/M 841-206-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	Q-841-206 W	Idler Shaft
	1		Cotter, 1/4" x 2-1/2"
	1		1/8" Hydraulic Alemite, Male
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
2.	1	19-415-B	Sprocket, 17-Tooth
	2	C-8-35	Bronze Bushing
3.	1	U-17-15	Pipe Spacer
4.	1	N-841-206 W	Bracket
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
5.	1	H-841-206 W	Lever Arm
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 2"
6.	2	740	Weight
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-3/4"

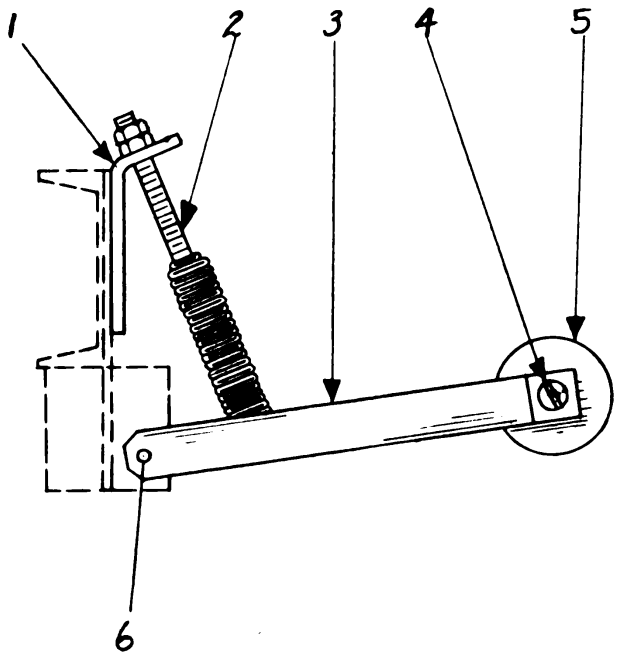
WATER PUMP
(B/M 841-16-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PU-AM-A1	Centrifugal Pump, American Well Works, 2" x 6-1/2" - Type U (See Accessory Section)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	1		Street Elbow, 1/8"
2.	1	PL-PY-D1	Pulley
	1	Q-17-30	Key, 1/4" x 1/4" x 1-1/4"
	1		Allen Cup Point Safety Set Screw, 1/4" x 3/8"
	1		Allen Cup Point Safety Set Screw, 1/4" x 1/2"

WATER PUMP DRIVE IDLER
(B/M 841-124-A)

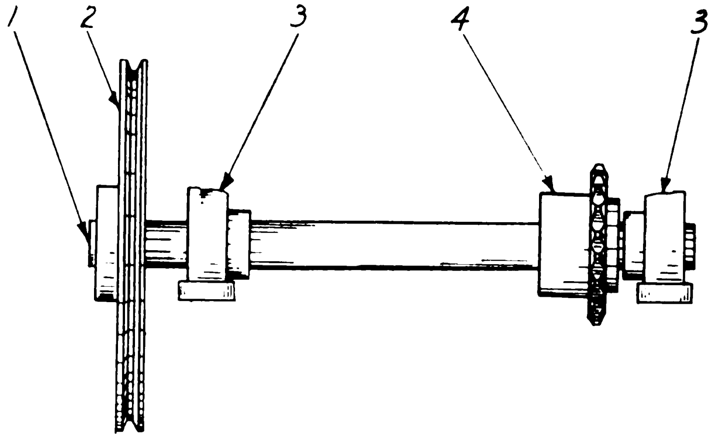
See Parts List on following page.



Water Pump Drive Idler (Continued)
(B/M 841-124-A)

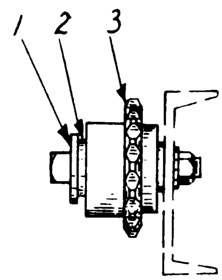
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	F-841-125	Support Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
2.	1	B1-46-87	Extension Spring & Bolt
	2		Hex Nut, 1/2"
3.	1	A-841-125 W	Idler Bracket
4.	1	A-17-83	Flat Head Cap Screw, 3/4" x 4-1/2"
	1		Hex Nut, & Lock Washer, 3/4"
	1		Half Nut, 3/4"
	1		1/8" x 90° Hydraulic Alemite, Male
5.	1	C-3-1201 A	Roller
6.	1	GE-17-25	Shaft, 1/2" x 4-1/8" S.A.E. 1020
	2		Cotter, 1/8" x 1"

WATER PUMP COUNTER SHAFT
(B/M 841-15-A)



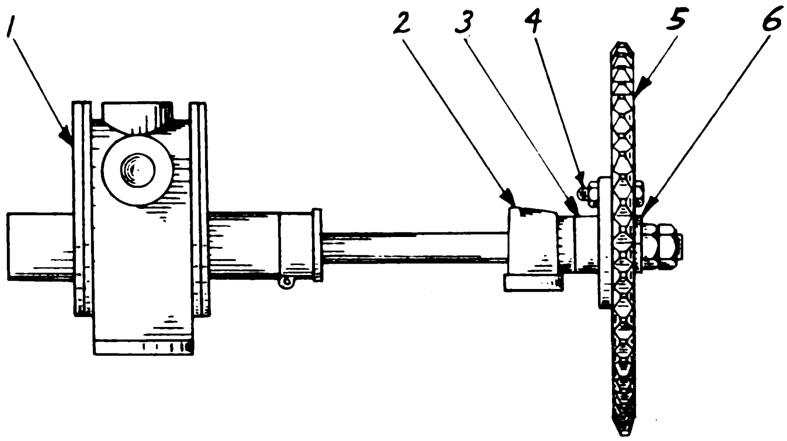
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-15	Shaft, 1-7/16" x 1' 7-3/4" S.A.E. 1045
2.	1	PL-DR-B1	Pulley
	1	AP-17-32	Key, 3/8" x 3/8" x 1-1/2"
	1		Allen Cup Point Safety Set Screw, 1/4" x 3/8"
	1		Allen Cup Point Safety Set Screw, 1/4" x 1/2"
3.	2	BR-F-01	Ball Bearing, 1-7/16" Fafnir LAK Type
	4		Machine Bolt, Nut, Lock Washer, & Cut Washer, 1/2" x 2-1/2"
	8		1/2" Bevel Washers
	4	BA-17-109	Shim, #16 Ga.
	4	BC-17-109	Shim, #12 Ga.
	2		1/8" x 90° Hydraulic Alemite, Male
	4	M-17-28	Stop Shim, 1/4" x 2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
4.	1	19-458-X	Sprocket 19-Tooth
	1	I-17-32	Key, 3/8" x 3/8" x 2-5/8"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"

WATER PUMP COUNTER SHAFT IDLER
(B/M 841-92-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	G-17-9	Washer
2.	1	A-841-92	Shaft, 1-7/16" x 2-7/8" S.A.E. 1020
	1		Machine Bolt, Nut, & Lock Washer, 5/8" x 4-1/2"
3.	1	G-19-833 W	Sprocket, 17-Tooth
	2	C-8-35	Bronze Bushing
	1		1/8" Hydraulic Alemite

BITUMEN METERING PUMP
(B/M 840-19-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PU-K-E1	Kinney Pump, 1-1/4" Model SD-312 See Accessory Section
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
	1		Hex Nut, 3/4"
	1		Half Nut, 3/4"
	1		1/8" x 90° Hydraulic Alemite, Male
2.	1	BR-F-V1	Ball Bearing 3/4" Fafnir LAK Type
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"
	2	N-17-71	Shim, 1/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	1	BV-17-139	Shim, 16 Ga.
	2	BW-17-139	Shim, 20 Ga.
	1		1/8" x 90° Hydraulic Alemite, Male

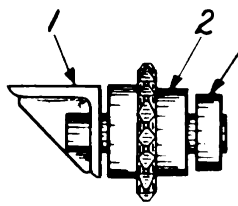
Bitumen Metering Pump (Continued)

(B/M 840-19-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
3.	1	A-3-1152	Hub
	1	E-3-841	Steel Bushing
	1	CC-17-41	Key, 3/16" x 3/16" x 1-7/16"
4.	1		Hex Head Cap Screw, Nut, & Lock Washer, 3/16" x 1-1/4" Breaker Bolt
5.	1	A-19-799	Sprocket, 29-Tooth
5.	1	B-19-799	Sprocket, 32-Tooth
5.	1	C-19-799	Sprocket, 35-Tooth
5.	1	D-19-799	Sprocket, 39-Tooth
5.	1	E-19-799	Sprocket, 43-Tooth
5.	1	F-19-799	Sprocket, 47-Tooth
5.	1	G-19-799	Sprocket, 52-Tooth
5.	1	J-19-799	Sprocket, 24-Tooth
5.	1	K-19-799	Sprocket, 26-Tooth
6.	1	JK-17-9	Washer

METERING PUMP DRIVE IDLER

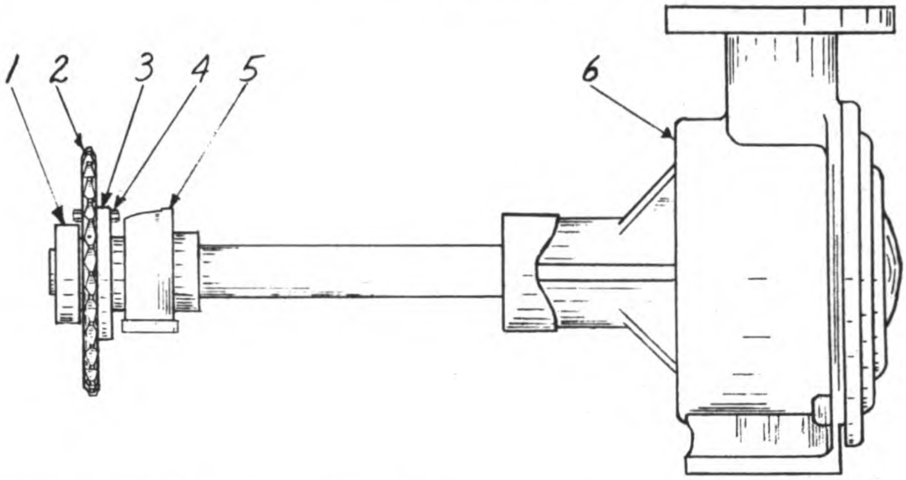
(B/M 841-91-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-91 W	Idler Shaft
	1		1/8" x 90° Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	1		Cut Washer, 1/2"
	2		Bevel Washer, 1/2"
2.	1	19-415-B	Sprocket, 17-Tooth
	2	C-8-35	Bronze Bushing
3.	1	GG-3-935	Set Collar
	2		Set Screw, 3/8" x 1/2"

Always give Serial Number of Machine, Parts Number and Description.

SUPPLY PUMP
(B/M 842-129-B)

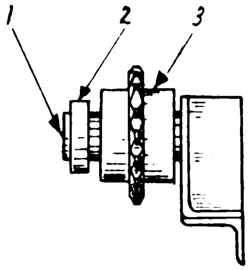


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	GG-3-935	Collar
	2		Set Screw, 3/8" x 1/2"
2.	1	D-19-516	Sprocket, 29-Tooth
3.	1	G-3-926	Sprocket Hub
	1	C-3-841	Steel Bushing
	1	BB-17-30	Key, 1/4" x 1/4" x 1-1/8"
	1		Hex Head Cap Screw, Nut, & Lock Washer, 1/4" x 1-1/2" Breaker Bolt
4.	1	BR-F-01	Ball Bearing, 1-7/16" Fafnir LAK Type
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-3/4"
	1		1/8" Hydraulic Alemite, Male
	2	BA-17-109	Shim, 16 Ga.
	2	BC-17-109	Shim, 12 Ga.
	1	BE-17-109	Shim, 20 Ga.
5.	1	PU-VK-C	Viking Pump, 2-1/2" Model ELQ (For Details See Accessory Section)
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
	1	QQ-17-111	Shim, 1/4" x 3" Bar
	2	SS-17-111	Shim, 12 Ga.
	2	TT-17-111	Shim, 16 Ga.
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	1		Reducing Bushing, 1/2" x 1/4"
	1		Pet Cock, 1/4"
	2		Pipe Plug, 1/2"
	1	C-17-122	Pipe, 1/2" x 2-1/2"
	1		Elbow, 1/2" x 90°
	1		1/2" Tee-Head Brass Stop Valve #276 Crane
	1		Street Elbow, 1/8"
	1	CA-17-43	Pipe, 1/2" x 3"

Always give Serial Number of Machine, Parts Number and Description.

SUPPLY PUMP DRIVE IDLER

(B/M 841-80-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-841-80 W	Idler Shaft
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		Cut Washer, 1/2"
	1		1/8" x 90° Hydraulic Alemite, Male
2.	1	GG-3-935	Set Collar
	2		Set Screw, 3/8" x 1/2"
3.	1	19-415-B	Sprocket, 17-Tooth
	2	C 8-35	Bronze Bushing

841 PIPING

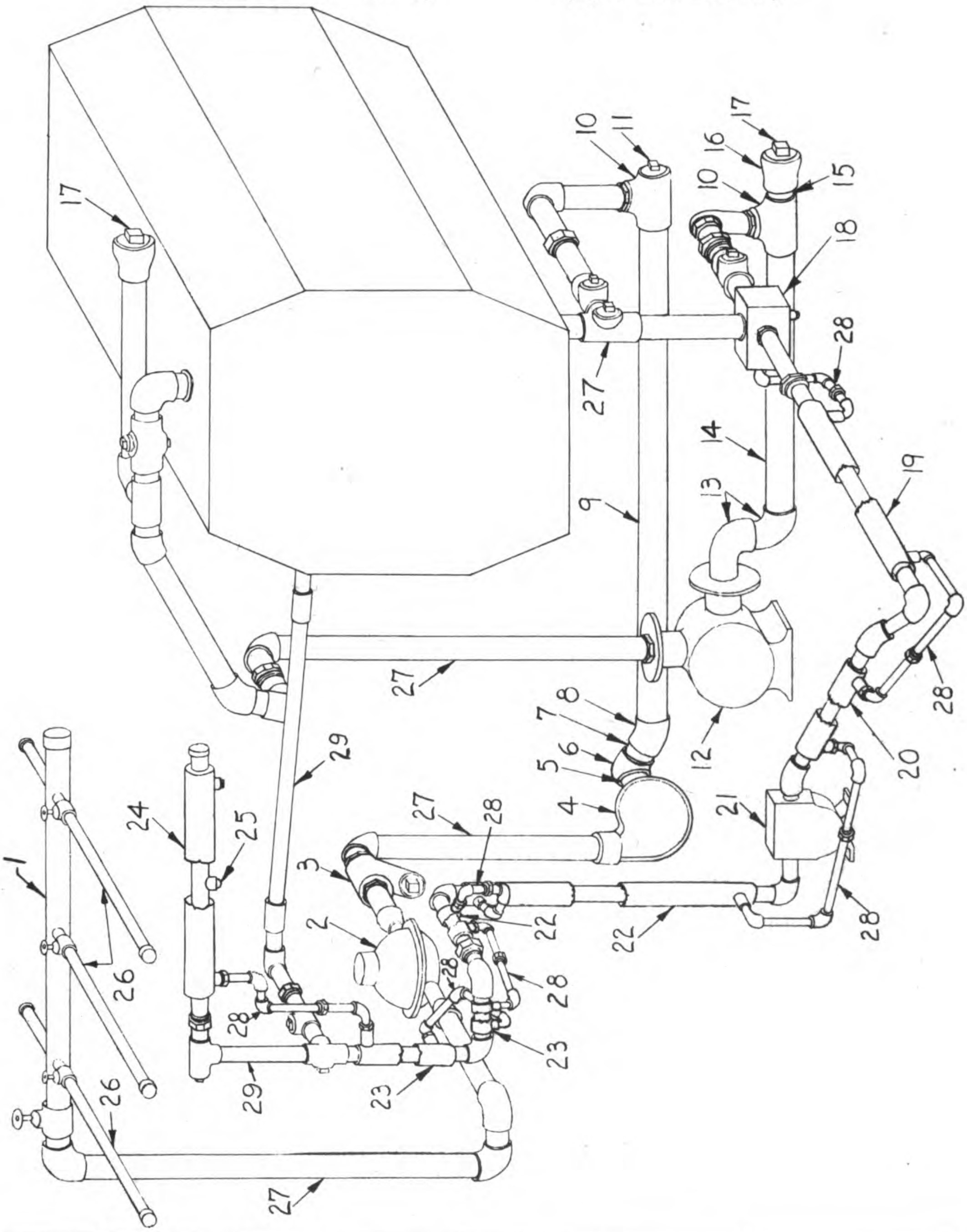
(B/M 841-38-A)
(B/M 841-101-A)
(B/M 841-102-A)
(B/M 841-106-A)
(B/M 841-32-A)
(B/M 841-154-A)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-841-37 W	Header
	1		Pipe Cap, 2"
	1		Gate Valve, 2", Crane 449½
2.	1	WM-BM-A1	Water Meter, Niagara Type FV Special Barber-Greene Buffalo Meter (See Accessory Section)
3.	1	PF-ST-A1	Water Strainer, 2-1/2" Leslie Style "B"
	1		Pipe Plug, 1-1/4"
	1	PF-ST-A1-1	Strainer Sieve for #3
4.			Water Pump (See Pumps)
5.	1	A-17-128	Pipe, 2-1/2" x 2"
6.	1		Elbow, 2-1/2" x 90°
7.	1	T-17-128	Pipe, 2-1/2" x 6-1/2"
8.	1		Elbow, 2-1/2" x 30°
9.	1	S-17-128	Pipe, 2-1/2" x 2' 10"
10.	2		Tee, 2-1/2" x 2-1/2" x 2-1/2"
11.	1		Pipe Plug, 2-1/2"
12.			Supply Pump (See Pumps)
13.	2		Street Elbow, 2-1/2" x 90°
14.	1	W-17-128	Pipe, 2-1/2" x 1' 4"
15.	1	A-17-128	Pipe, 2-1/2" x 2-1/2"
16.	1		Reducing Coupling, 3" x 2-1/2"
17.	2		Pipe Plug, 3"
18.			Bitumen Strainer Unit (See Page 436)
19.	1	C-17-190 W	Steam Jacketed Pipe

841 Piping (Continued)

(B/M 841-38-A) (B/M 841-101-A) (B/M 841-102-A) (B/M 841-106-A) (B/M 841-32-A) (B/M 841-154-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
20.	1	G-17-191 W	Steam Jacketed Pipe
21.			Bitumen Metering Pump (See Pumps)
22.	2	A-17-190 W	Steam Jacketed Pipe
23.	2	D-17-191 W	Steam Jacketed Pipe
24.	1	A-840-94 W	Spray Bar
	1		Pipe Cap, 1-1/2"
25.	1		Kinney Nozzle, 1/8" Slotted Type
26.			Piping, 3/4" x 10'
	5		Pipe Cap, 3/4"
	3		Gate Valve, 3/4", Crane 449½

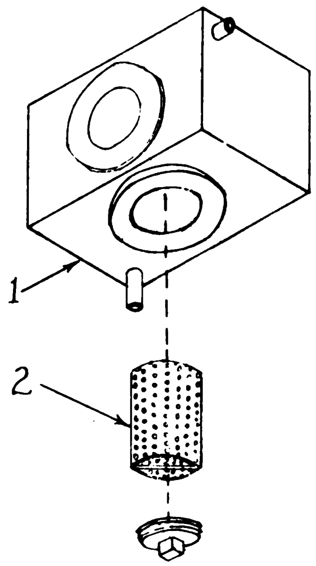
841 Piping (Continued)

(B/M 841-38-A) (B/M 841-106-A)
(B/M 841-101-A) (B/M 841-32-A)
(B/M 841-102-A) (B/M 841-154-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
27.	1		Piping, 2" x 22'
	5		Reducing Bushing, 2-1/2" x 2"
	4		Gem Union, 2"
	3		Standard Cock, 2", 2 Way, 2 Port
	1		Cock, 2", 3 Way, 3 Port
	2		Street Elbow, 2" x 90°
	8		Elbow, 2" x 90°
	1		Elbow, 2" x 45°
	1		Elbow, 2" x 30°
	1		Tee, 2" x 2" x 2"
	1		Reducing Bushing, 3" x 2"
	1		Reducing Bushing, 2" x 1-1/4"
	2		Reducing Coupling, 2" x 1-1/2"
28.	1		Piping, 1/2" x 7'
	13		Street Elbow, 1/2"
	8		Gem Union, 1/2"
	7		Elbow, 1/2" x 90°
	2		Pipe Plug, 1/2"
29.	1		Piping, 1-1/4" x 7'
	6		Elbow, 1-1/4" x 90°
	4		Elbow, 1-1/4" x 30°
	2		Tee, 1-1/4" x 1-1/4" x 1-1/4"
	4		Gem Union, 1-1/4"
	1		Cock, 1-1/4", 3 way, 3 port
	2		Pipe Plug, 1-1/4"
	1		Reducing Coupling, 1-1/4" x 1-1/2"

B I T U M E N   S T R A I N E R   U N I T

(B/M 840-93-A2)



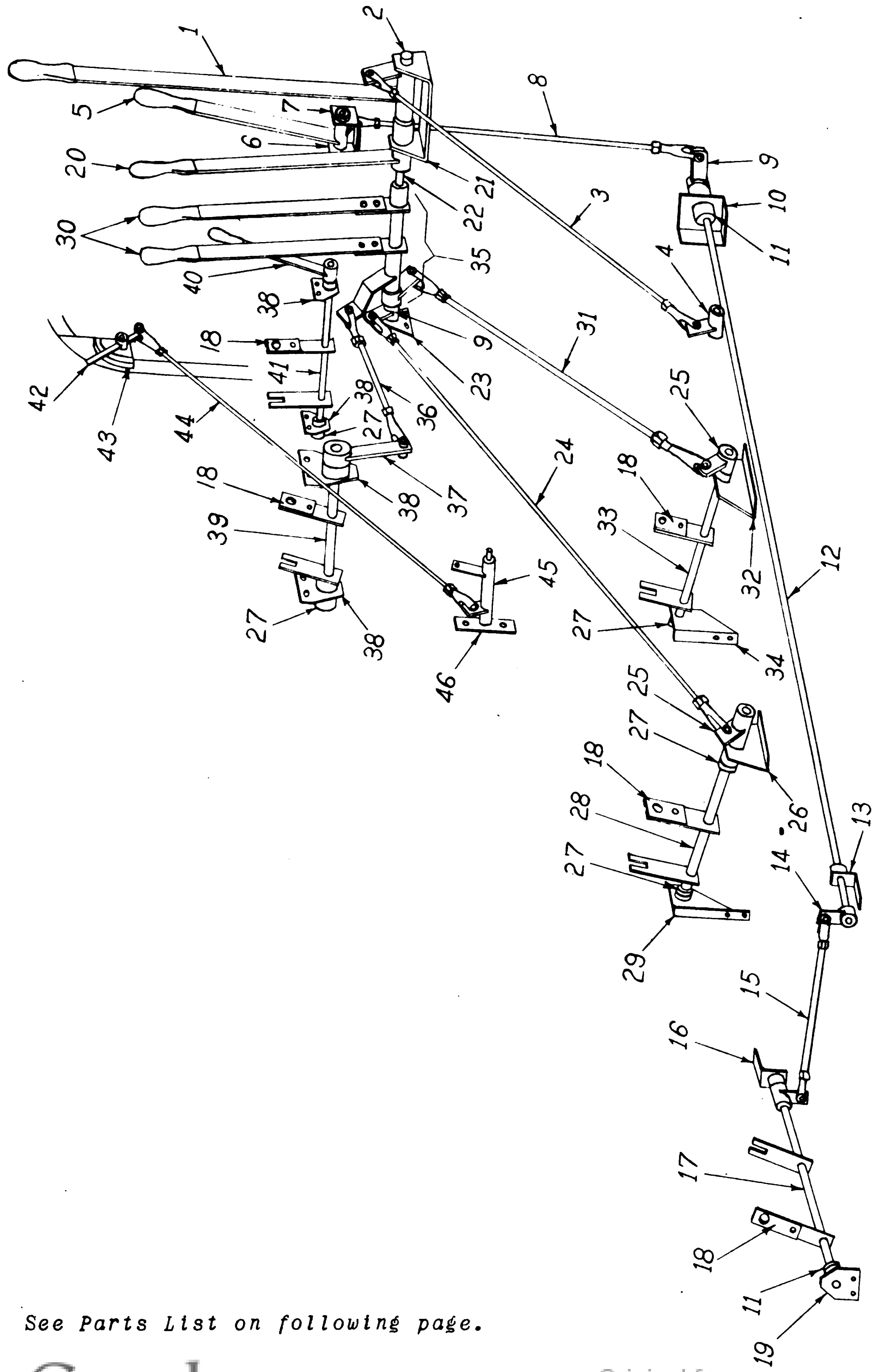
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	F-840-94 W	Strainer Box
	1		Pipe Plug, 2"
2.	1	C-3-1158 S	Strainer

CONTROLS

(B/M 841-84-A)
(B/M 841-180-A)

(B/M 841-81-A)
(B/M 841-78-A)
(B/M 841-76-A)

(B/M 841-73-A)
(B/M 841-131-A)



See Parts List on following page.

Controls (Continued)

(B/M 841-84-A)
(B/M 841-180-A)

(B/M 841-81-A)
(B/M 841-78-A)
(B/M 841-76-A)

(B/M 841-73-A)
(B/M 841-131-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-3-1198 W	Lever (Master Clutch)
	1		1/8" x 30° Hydraulic Alemite, Male
2.	1	A-841-84	Shaft, 1" x 6-1/2" S.A.E. 1020
3.	1	BP-17-144	Rod
	2		Hex Nut, 3/4"
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
4.	1	M-3-1154 W	Arm Coupling
	1		Key, Woodruff No, "A"
	1		Set Screw, 3/8" x 5/8"
	1		Set Screw, 3/8" x 3/4"
5.	1	E-3-1198 W	Lever (Conveyor)
	1		1/8" x 30° Hydraulic Alemite, Male
6.	1	U-841-79	Bracket
7.	1	AA-841-79 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
8.	1	AG-17-144	Rod
	2		Hex Nut, 3/4"
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
9.	2	A-3-1028 W	Lever Arm
	2		Set Screw, 3/8" x 3/4"
	2		Set Screw, 3/8" x 1"
10.	1	O-841-180 W	Bracket
	1		1/8" x 30° Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
	1		Bevel Washer, 1/2"
11.	2	A-3-951	Collar
	2		Set Screw, 3/8" x 3/4"
	2		1/8" Hydraulic Alemite, Male
12.	1	Q-841-180	Shaft, 1" x 6' 9-11/16" S.A.E. 1020
	2	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
13.	1	M-841-180 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
	1		1/8" x 30° Hydraulic Alemite, Male
14.	1	H-3-1028 W	Lever Arm
	1		Set Screw, 3/8" x 3/4"
	1		Set Screw, 3/8" x 1"

Controls (Continued)

(B/M 841-84-A)
(B/M 841-180-A)

(B/M 841-81-A)
(B/M 841-78-A)
(B/M 841-76-A)

(B/M 841-73-A)
(B/M 841-131-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
15.	1	BY-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
16.	1	H-841-180 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
	1		1/8" x 30° Hydraulic Alemite, Male
	4		Cut Washer, 1"
17.	1	A-841-180 W	Shifter
18.	5	F-3-1028	Lock Bar
	5		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 3/8" x 1-1/4"
19.	1	E-841-180 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
20.	1	D-3-1196 W	Lever (Bitumen Metering)
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 3/4"
	1		Set Screw, 3/8" x 1"
21.	1	N-841-77 W	Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		Set Screw, 3/8" x 3/4"
22.	1	C-841-81	Shaft, 1" x 1' 9" S.A.E. 1045
23.	1	P-841-77 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" x 30° Hydraulic Alemite, Male
24.	1	BN-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
25.	2	K-3-1032 W	Lever Arm
	2	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	4		Set Screws, 3/8" x 3/4"
26.	1	J-841-79 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Bevel Washer, 1/2"
	1		1/8" x 30° Hydraulic Alemite, Male
27.	5	T-3-932	Collar
	5		Set Screw, 3/8" x 3/4"

Controls (Continued)

(B/M 841-84-A)
(B/M 841-180-A)

(B/M 841-81-A)
(B/M 841-78-A)
(B/M 841-76-A)

(B/M 841-73-A)
(B/M 841-131-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
28.	1	A-841-81 W	Shifter
29.	1	F-841-79 W	Bracket
	2		Machine Bolt Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
30.	2	C-3-1196	Lever (Water Pump & Bitumen Supply)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
31.	1	BT-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
32.	1	T-841-77 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Bevel Washer, 1/2"
	1		1/8" x 90° Hydraulic Alemite, Male
33.	1	A-841-78 W	Shifter
34.	1	A-841-79 W	Bearing Bracket
	1		1/8" x 90° Hydraulic Alemite, Male
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 5"
35.	1	F-841-77 W	Lever Arm
	2		1/8" x 30° Hydraulic Alemite, Male
36.	1	CW-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
37.	1	J-3-1032 W	Lever Arm
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	2		Set Screws, 3/8" x 3/4"
38.	2	A-841-73 W	Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	4		1/8" x 90° Hydraulic Alemite , Male
39.	1	A-841-76 W	Shifter
40.	1	A-3-1196 W	Lever (Pugmill)
	2		Set Screws, 3/8" x 3/4"
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
41.	1	E-841-73 W	Shifter
42.	1		Lever, See Engine Throttle Group
43.	1		Quadrant Assembly, See Engine Throttle Group
	8		Cut Washer, 3/8"

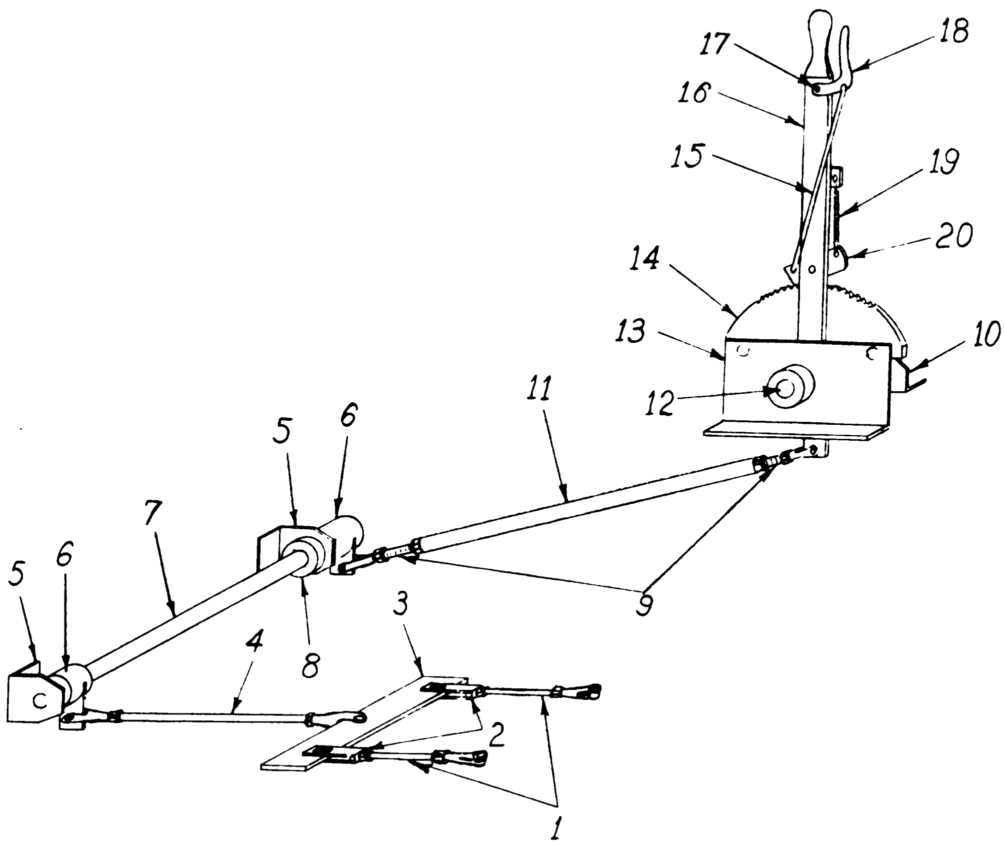
Controls (Continued)

(B/M 841-84-A) (B/M 841-180-A) | (B/M 841-81-A) (B/M 841-78-A) (B/M 841-76-A) | (B/M 841-73-A) (B/M 841-131-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
44.	1	BX-17-144	Rod
	2	A-3-604	Yoke End
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 1/2"
45.	1	A-841-131 W	Throttle Arm
46.	1	K-840-109 W	Shifter Pin
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	1		Cotter, 1/8" x 1"

PARKING BRAKE CONTROL

(B/M 841-203-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	UU-17-144	Rod
	2	A-3-604	Yoke End
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
	4		Hex Nut, 1/2"
2.	2	V-831-159 W	Yoke End
	2	C-17-23	Rivet
	4		Cut Washer, 1/2"
	2		Cotter, 1/8" x 1"

Parking Brake Control (Continued)

(B/M 841-203-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
3.	1	Q-841-203	Equalizer
4.	1	Y-17-144	Rod
	2	A-3-604	Yoke End
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
5.	2	N-841-203 W	Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		1/8" x 90° Hydraulic Alemite, Male
6.	2	G-3-1032 W	Lever Arm
	2		Set Screw, 3/8" x 7/8"
	2		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
	2	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
7.	1	K-841-203	Shaft, 1-1/4" x 2' 4-1/2" S.A.E. 1020
8.	1	A-3-987	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
9.	2	YY-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	4		Half Nut, 3/4"
10.	1	E-841-203 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 1-1/2"
	1		1/8" Hydraulic Alemite
11.	1	G-841-203 W	Rod
12.	1	J-841-203	Shaft, 1-1/4" x 5-1/4" S.A.E. 1020
13.	1	A-841-203 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 1-1/2"
	1		1/8" Hydraulic Alemite
14.	1	M-3-1197	Ratchet
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 1-3/4"
	4	DM-17-9	Washer
15.	1	G-3-1197	Rod
	2		Cotter, 3/32" x 1"
16.	1	A-3-1197 W	Lever
	1	E-17-30	Key, 1/4" x 1/4" x 2"
	1		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
	1		Set Screw, 3/8" x 7/8"
17.	1	DC-17-23	Rivet
18.	1	G-62-33	Grip Latch
19.	1	D-46-154	Spring
	2		Round Head Stove Bolt, Nut, & Lock Washer, 1/4" x 3/4"
20.	1	F-3-1197	Latch
	1	B-17-10	Spacer
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 2"

BITUMEN TANK HEATING SYSTEM

(B/M 841-156-A)

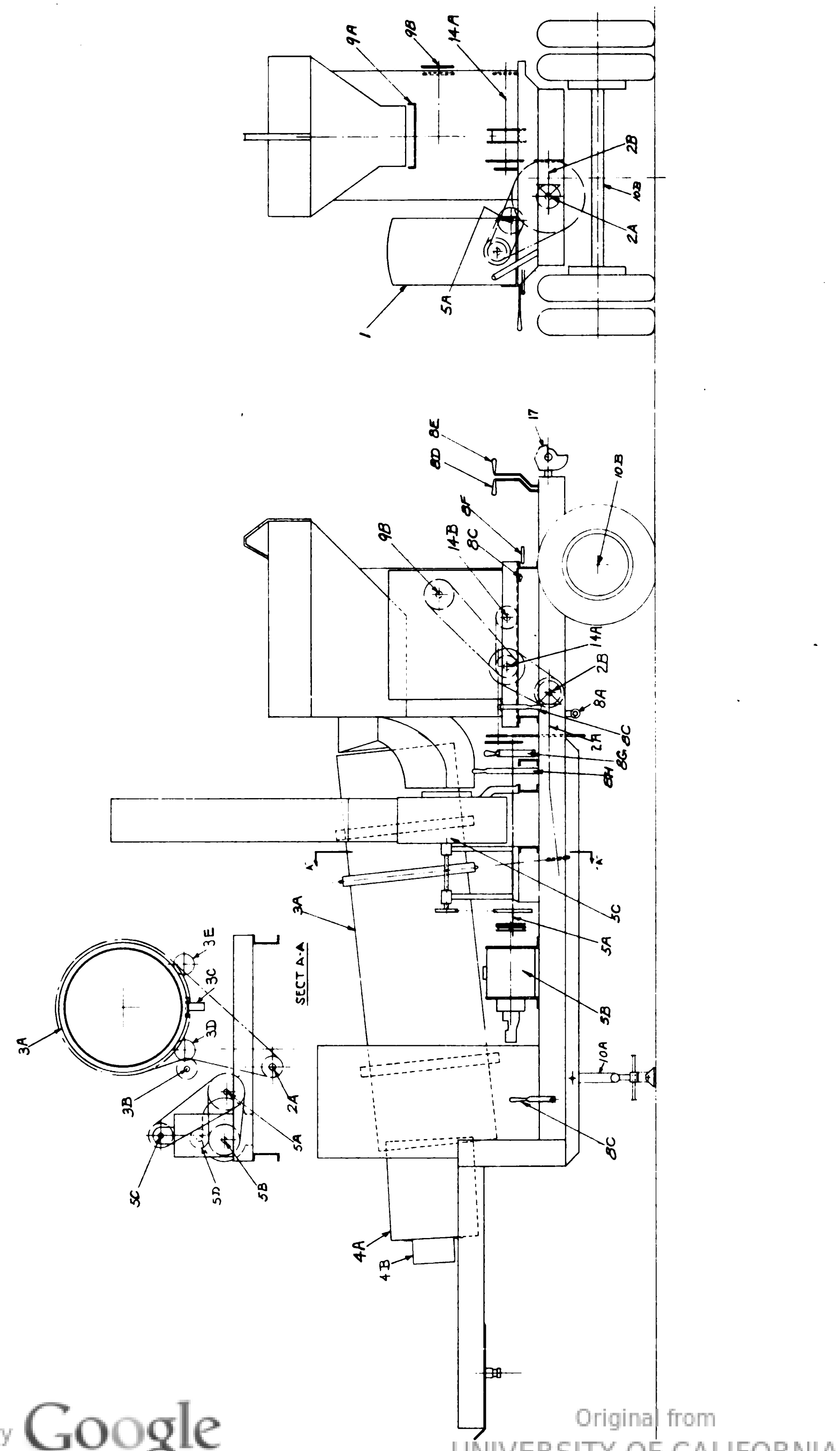
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	BU-AE-A1	Aeroil #13BG Burner (For Details See Accessory Section)
	1	TA-AE-A1	Aeroil 20 gallon tank (For Details See Accessory Section)
	1	HO-PD-E4	1/4" Hose x 5' 0" Long With 1/4" Male fitting on both ends.
	1	TH-TA-A	Taylor 90° Angle Thermometer #24245 with Union Hub #P-510 6" Thermometer Stem Length and 7" Scale Length reading from 50° to 400° F.

T O O L S

(B/M 841-104-A1)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	A-46-20	Ball Pein Hammer, 1-3/4#
	1	B-46-20	Engineer's Wrench, 3/8" x 1/2"
	1	WW-46-20	Engineer's Wrench, 5/8" x 3/4"
	1	MM-46-20	Adjustable Wrench, 12"
	1	J-46-20	Octagon Cold Chisel, 3/4"
	1	N-46-20	Pliers, 8"
	1	P-46-20	Screw Driver, 6"
	1	EE-46-20	Octagon Drift, 3/4"
	1	AC-46-20	Allen Cup Point Safety Set Screw Wrench, 5/16"
	1	M-46-20	Allen Cup Point Safety Set Screw Wrench, 3/8"
	1	AE-46-20	Allen Cup Point Safety Set Screw Wrench, 7/16"
	1	U-46-20	Allen Cup Point Safety Set Screw Wrench, 1/2"
	1	BB-46-20	Oil Can
	1	AN-46-20	Alemite Gat Gun
	1	AP-46-20	Hydraulic Extension Adaper (For Gat Gun)
	1	AV-46-20	Wheel Rim Stud Nut Wrench & Budd Handle #44201
	2	AW-46-20	Heavy Duty Tire Tool
	1	AS-46-20	Tire Hammer
	1	A-46-277	Wrecking Bar
	1	F-46-20	Open End Steel Workers Wrench, 1-1/4"
	1	HJ-BL-A2	Hydraulic Jack (For Details See Accessory Section)
	1	BF-46-20	Budd Handle #44201

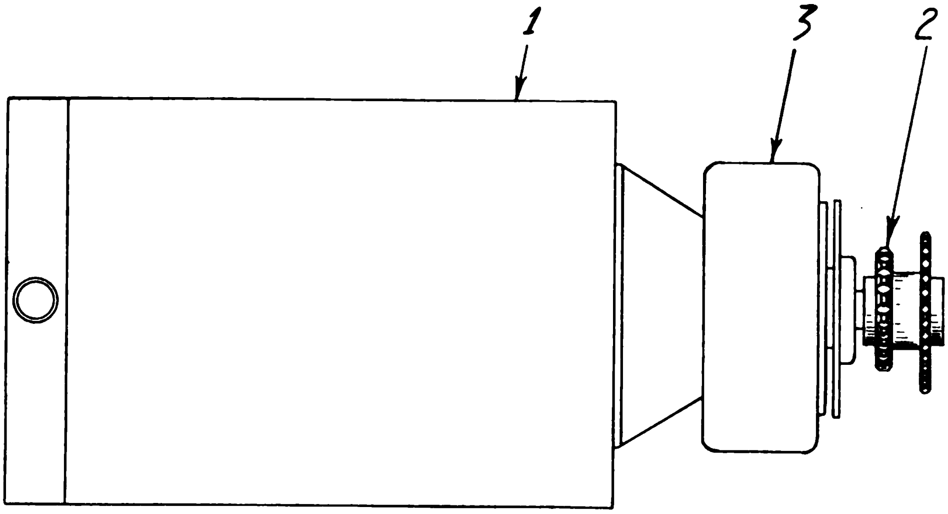
Barber-Greene Model 831 Dryer



CONTENTS

POWER UNIT

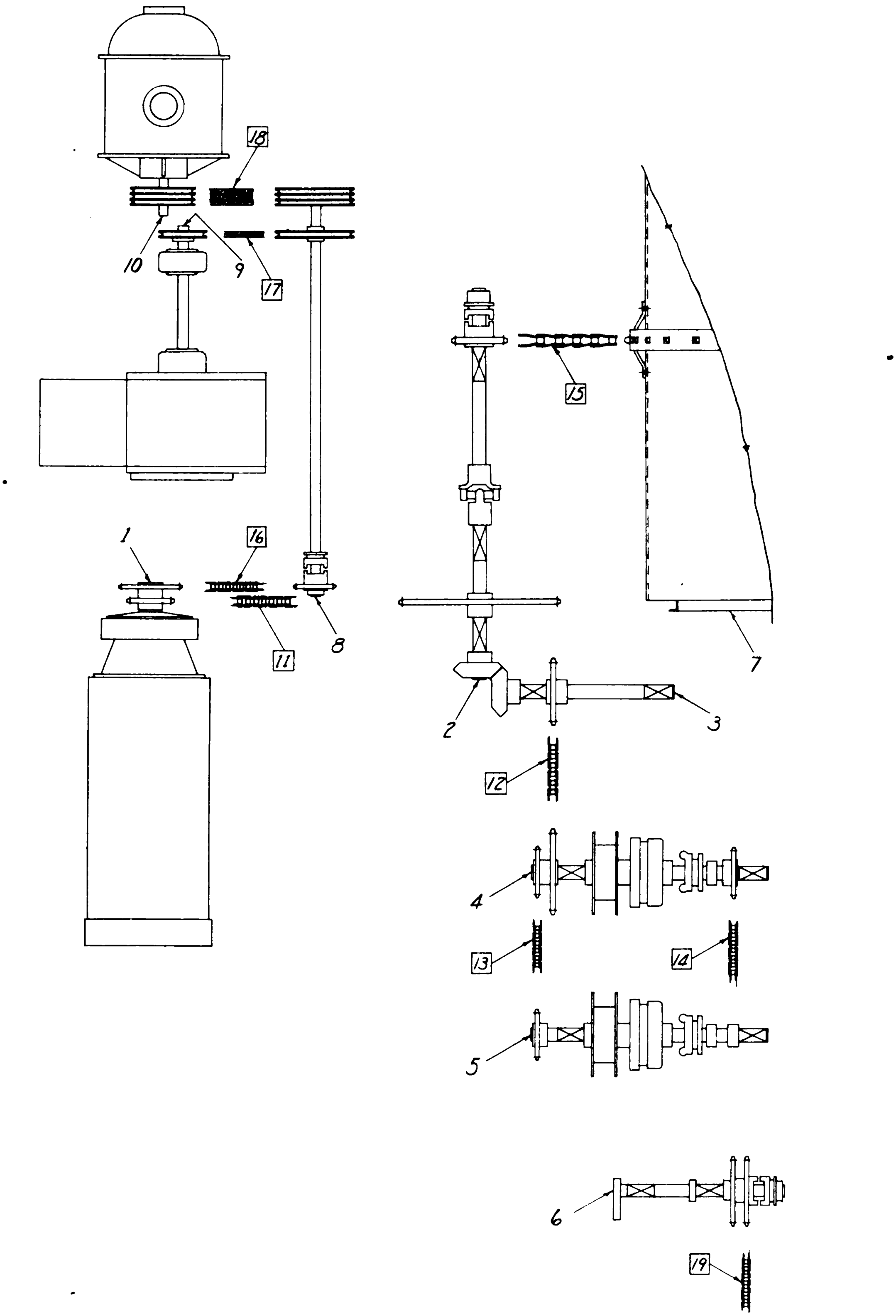
(B/M 831-123-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	EN-L-A11	LeRoi Power Unit Model D201P3 (For Details See Engine Section)
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	4		Bevel Washers, 5/8"
	4		Machine Bolt, Nut, & Lock Washer, & two Cut Washers, 5/8" x 2"
	2	BG-17-24	Take Up Bolt
	6		Hexagonal Nuts, 3/4"
2.	1	E-19-857-W	Double Sprocket
	1	C-17-33	Key, 1/2" x 1/2" x 3-1/4"
	1		Allen Cup Point Safety Set Screw, 1/2" x 3/4"
	1		Allen Cup Point Safety Set Screw, 1/2" x 1"
3.	1	SR-L-A1	Reducer and Clutch, LeRoi #2G13-33-11, for D201 Engine (See Accessory Section for details)

Always give Serial Number of Machine, Parts Number and Description.

831 DRIVE CHAINS



831 Drive Chains (Continued)

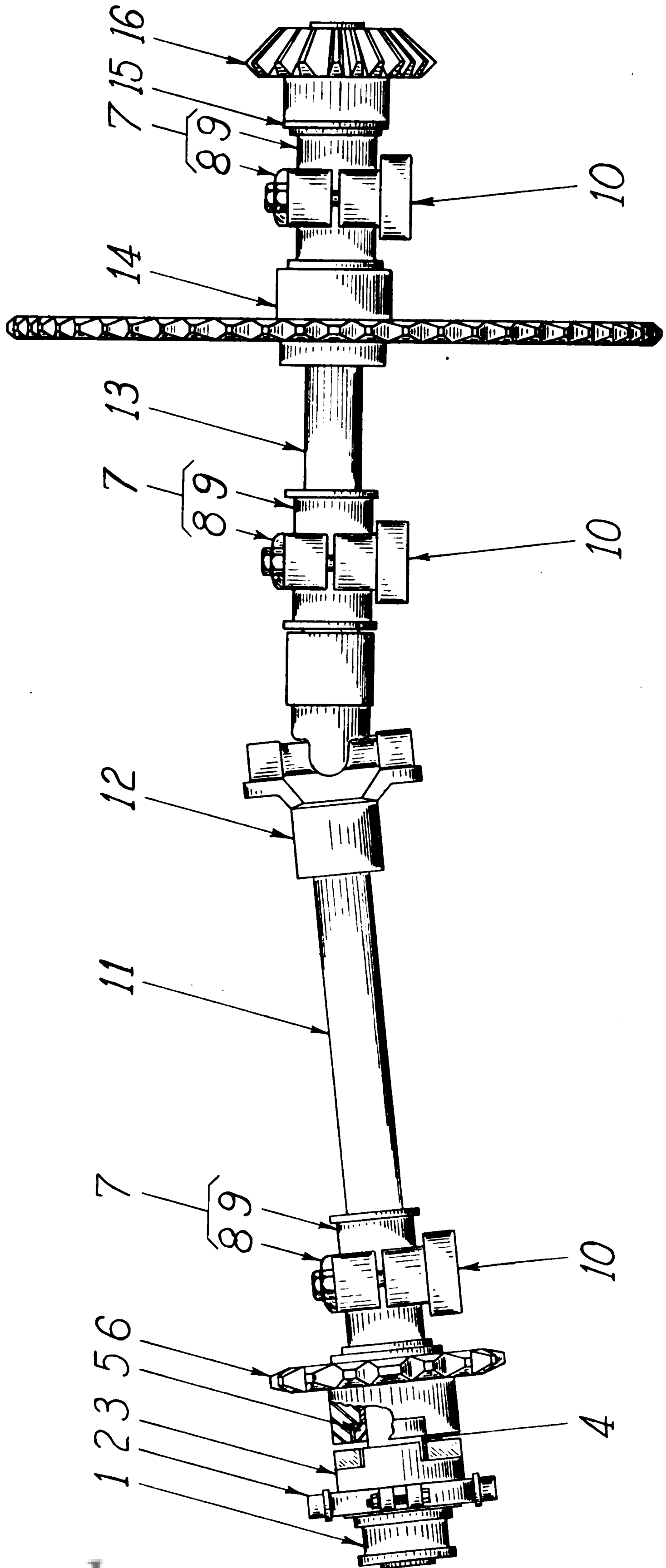
1. Engine
2. Main Jack Shaft
3. Intermediate Jack Shaft
4. Dragline Shaft #1
5. Dragline Shaft #2
6. Feeder Crank Shaft
7. Drum
8. Fan and Blower Jack Shaft
9. Fan Shaft
10. Blower Shaft

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
11.	1	AZ-6-64C	Strand of Diamond #470 1-1/4" P. 74 Links - 1 offset
12.	1	XX-6-64C	Strand of Diamond #470 1-1/4" P. 48 Links
13.	1	YY-6-58C	Strand of Diamond #434 1" P. 48 Links - 1 offset
14.	1	BK-6-58C	Strand of Diamond #434 1" P. 84 Links - 1 offset
15.	1	AT-6-114R	Strand of Rex "Chabelco" #A-508 2.62" P. - 69 Links
16.	1	QQ-6-58C	Strand of Diamond #434 1" P. 42 Links
17.	1	BE-PY-C1	Pyott #B-75 V-Belt
18.	1	BE-PY-B1	Pyott #B-60 Matched Set of 3 V-Belts
19.	1	EK-6-58C	Strand of Diamond #434 1" P. 160 Links
		A-6-64	Roller Link Diamond #470 1-1/4" P.
		B-6-64	Connecting Link Diamond #470 1-1/4" P.
		C-6-64	Offset Link Diamond #470 1-1/4" P.
		A-6-58	Roller Link Diamond #434 1" P.
		B-6-58	Connecting Link Diamond #434 1" P.
		C-6-58	Offset Link Diamond #434 1" P.
		A-6-114	Roller Link Rex "Chabelco" #A-508 2.62" P.

MAIN JACK SHAFT
(B/M 831-117-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	136	Collar
	1		Low Head Set Screw, 5/8" x 7/8"
2.	1	2427	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
	1		1/4" Hydraulic Alemite, Male
3.	1	2864 B	Jaw Clutch
4.	1	G-17-106	Feather Key, 1/2" x 1/2" x 3-3/4"
5.	1	E-3-941	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 1/2"
6.	1	3634	Sprocket, 8-Tooth
	1	J-8-75	Bronze Bushing
	1	Q-8-75	Bronze Bushing
	1		1/8" Hydraulic Alemite, Male
7.	3	13-213-P	Ball & Socket Bearing (Complete)
	6		Machine Bolt, Nut, & Jam Nut, 5/8" x 6"
8.	3	822-B	Bearing Cap
9.	3	3705	Bearing
	6	M-8-75	Bronze Bushing
	2		Grease Piping, Center&Clutch End Bearings
	2	AF-17-43	Pipe, 1/4" x 2-1/2"
	2		Elbow, 1/4" x 90°
	2	J-17-120	Pipe, 1/4" x 3' 2"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
			Grease Piping, Gear End Bearing
	1	AF-17-43	Pipe, 1/4" x 2-1/2"
	1		Elbow, 1/4" x 90°

Main Jack Shaft (Continued)



Main Jack Shaft (Continued)

(B/M 831-117-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	C-17-120	Pipe, 1/4" x 1' 0"
	1	U-17-43	Pipe, 1/4" x 5"
	1	BM-17-43	Pipe, 1/4" x 1' 11"
	1		Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
10.	3	821	Bearing Base
	6	BO-17-109	Shim, 16 Ga.
	3	BP-17-109	Shim, 12 Ga.
	4		Bevel Washer, 5/8"
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3-1/2"
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	6	QQ-17-111	Stop Shim, 1/4"
	6	SS-17-111	Stop Shim, 12 Ga.
	12	TT-17-111	Stop Shim, 16 Ga.
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
11.	1	A-831-116	Shaft, 1-15/16" x 2' 3-5/8", S.A.E. 4140
12.	1	UJ-BW-A1	Universal Joint
	2	Z-17-33	Key, 1/2" x 1/2" x 2-5/8"
	4		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
	1		1/8" Hydraulic Alemite, Male
13.	1	B-831-116	Shaft, 1-15/16" x 2' 0-5/8", S.A.E. 4140
14.	1	A-19-857-W	Sprocket, 57-Tooth
	1	AG-17-33	Key, 1/2" x 1/2" x 3-7/16"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
15.	1	C-17-164	Bronze Washer
16.	1	A-18-238	Bevel Gear, 21-Tooth
	1	AG-17-33	Key, 1/2" x 1/2" x 3-7/16"
	1		Allen Cup Point Safety Set Screw, 5/8" x 3/4"
	1		Allen Cup Point Safety Set Screw, 5/8" x 1"

INTERMEDIATE JACK SHAFT

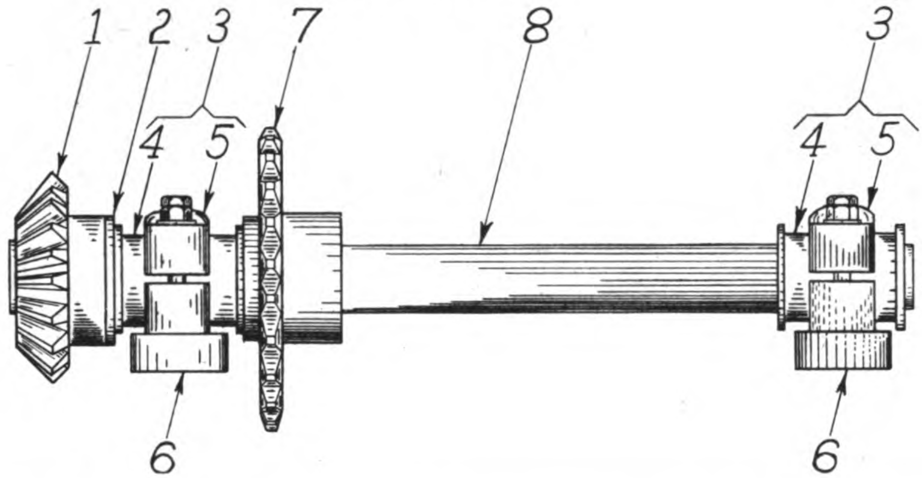
(B/M 831-118-A)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-18-238	Bevel Gear, 21-Tooth
	1	D-17-33	Key, 1/2" x 1/2" x 3-3/8"
	1		Allen Cup Point Safety Set Screw, 5/8" x 3/4"
	1		Allen Cup Point Safety Set Screw, 5/8" x 1"

Intermediate Shaft (Continued)

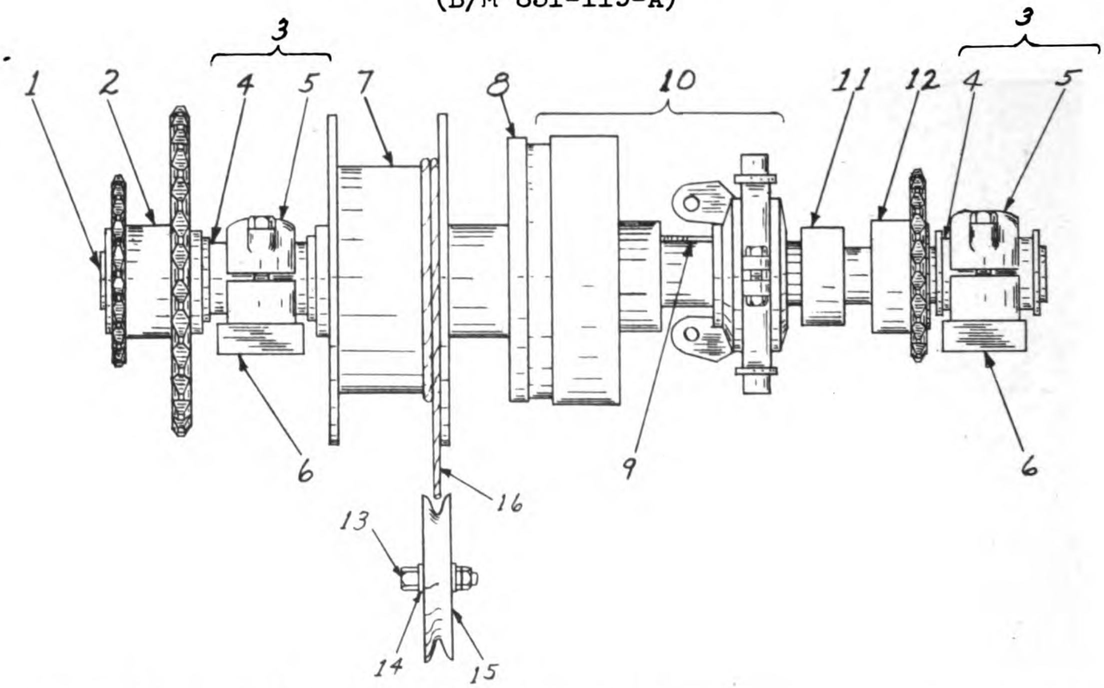
(B/M 831-118-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2.	1	K-17-164	Bronze Washer
3.	2	13-213-E	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Jam Nut, 5/8" x 6"
	4	S-8-75	Bronze Bushing (For #4)
4.	2	2419-B	Bearing
			Grease Piping, Bevel Gear End Bearing
	1	AV-17-43	Pipe, 1/8" x 3"
	1		Elbow, 1/8" x 90°
	1		Street Elbow, 1/8" x 90°
	1	JJ-17-119	Pipe, 1/8" x 2' 3"
	1		Coupling, 1/8"
	1		1/8" x 90° Hydraulic Alemite, Male
			Grease Piping, End Bearing
	1	AV-17-43	Pipe, 1/8" x 3"
	1		Elbow, 1/8" x 90°
	1	J-17-119	Pipe, 1/8" x 9"
	1		Coupling, 1/8"
	1		1/8" x 90° Hydraulic Alemite, Male
5.	2	822-B	Bearing Cap
6.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3-1/4"
	4	QQ-17-111	Stop Shim, 1/4"
	8	TT-17-111	Stop Shim, 16 Ga.
	4	SS-17-111	Stop Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
7.	1	19-601-U	Sprocket, 21-Tooth
	1		Set Screw, 5/8" x 1"
	1		Set Screw, 5/8" x 1-1/4"
	1	AH-17-33	Key, 1/2" x 1/2" x 2-7/8"
8.	1	A-831-118	Shaft, 1-15/16" x 2' 2-1/4", S.A.E. 4140

DRAGLINE SHAFT "A"

(B/M 831-119-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-831-119	Shaft, 1-15/16" x 2' 10", S.A.E. 4140
2.	1	D-19-857 W	Double Sprocket, 20 & 28-Tooth
	1	AG-17-33	Key, 1/2" x 1/2" x 3-7/16"
	1		Allen Cup Point Safety Set Screw, 1/2" x 3/4"
	1		Allen Cup Point Safety Set Screw, 1/2" x 1"
3.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
4.	2	2419-A	Bearing
	1		1/8" x 30° Hydraulic Alemite, Male
	1		1/8" x 90° Hydraulic Alemite, Male
5.	2	822-B	Bearing Cap
6.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	4	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	4	QQ-17-111	Shim, 1/4" x 2-1/2" Bar
	8	TT-17-111	Shim, 16 Ga.
	4	SS-17-111	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
7.	1	E-3-1210 W	Drum
	1		1/8" Hydraulic Alemite, Male
	2	G-8-75	Bushing (For No. 7)
8.	1	3442	Brake Drum
	1	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"

Dragline Shaft "A" (Continued)

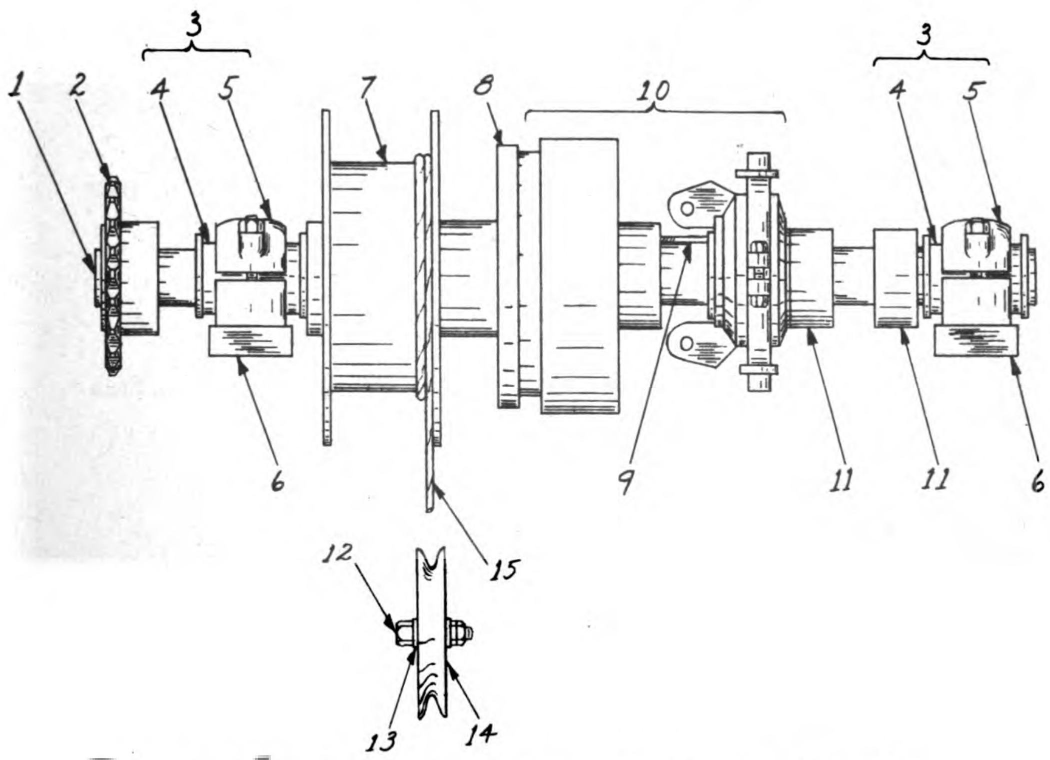
(B/M 831-119-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
9.	1	AM-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
10.	1	3-1007-A	8" B-G Friction Clutch (See Page 530 For Details)
	1		1/8" x 90° Hydraulic Alemite, Male
11.	1	A-3-941	Collar
	2		Set Screw, 3/8" x 1-1/4"
12.	1	19-473-F	Sprocket, 20-Tooth
	1	AR-17-33	Key, 1/2" x 1/2" x 1-15/16"
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
13.	1	A-17-84	Special Bolt
	2		Half Nut, 3/4"
	1		1/8" x 90° Hydraulic Alemite, Male
14.	1	B-17-82	Bushing
15.	1	868 A	Sheave
16.	1		5/16" Cable 75' 0"
	3		Cable Clamp, 5/16"
	1		Cable Thimble, 5/16"

DRAGLINE SHAFT "B"

(B/M 831-119-B)

See Parts List on following page.



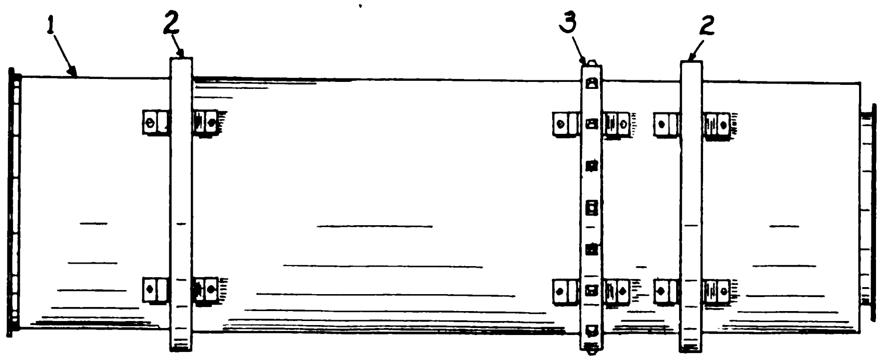
Dragline Shaft "B" (Continued)

(B/M 831-119-B)

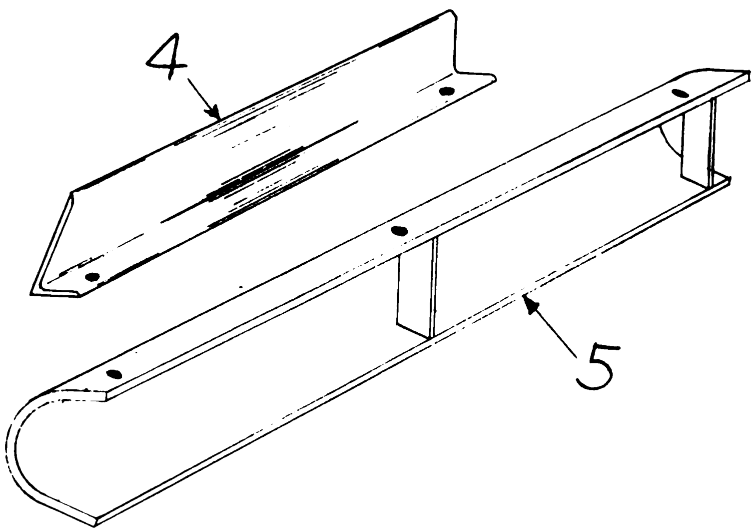
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-831-119	Shaft, 1-15/16" x 2' 10" S.A.E. 4140
2.	1	19-473-F	Sprocket, 20-Tooth
	1	AR-17-33	Key, 1/2" x 1/2" x 1-15/16"
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
3.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
4.	2	2419-A	Bearing
	1		1/8" x 30° Hydraulic Alemite, Male
	1		1/8" x 90° Hydraulic Alemite, Male
5.	2	822 B	Bearing Cap
6.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	4	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	4	QQ-17-111	Shim, 1/4" x 2-1/2" Bar
	8	TT-17-111	Shim, 16 Ga.
	4	SS-17-111	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
7.	1	E-3-1210 W	Drum
	1		1/8" Hydraulic Alemite, Male
	2	G-8-75	Bushing (For No. 7)
8.	1	3442	Brake Drum
	1	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"
9.	1	AM-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
10.	1	3-1007-A	8" B-G Friction Clutch (See Page 530 For Details)
	1		1/8" x 90° Hydraulic Alemite, Male
11.	2	A-3-941	Collar
	4		Set Screw, 3/8" x 1-1/4"
12.	1	A-17-84	Special Bolt
	2		Half Nut, 3/4"
	1		1/8" x 90° Hydraulic Alemite, Male
13.	1	B-17-82	Bushing
14.	1	868-A	Sheave
15.	1		5/16" Steel Cable 75' 0"
	3		Cable Clamp, 5/16"
	1		Cable Thimble, 5/16"

Always give Serial Number of Machine, Parts Number and Description.

D R Y E R   D R U M
(B/M 830-21-B)



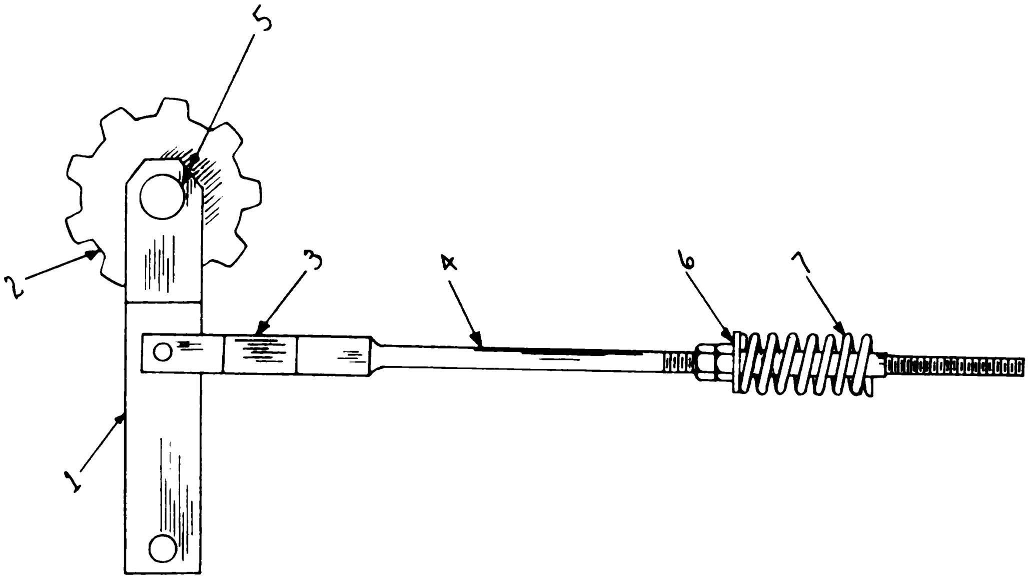
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	E-830-20 W	Dryer Drum (Complete, less flights)
2.	2	C-830-23 W	Trunnion Ring
	20	K-830-23	Filler
	20	M-830-23	Filler
	20	N-830-23	Filler
	20		Machine Bolt, 1/2" x 1-3/4"
	20		Anco Lock Nut, 1/2"
3.	1	G-830-23 W	Drive Sprocket
	10	K-830-23	Filler
	10	M-830-23	Filler
	10	N-830-23	Filler
	10		Machine Bolt, 1/2" x 1-3/4"
	10		Anco Lock Nut, 1/2"



4.	5	B-830-21	Flight
	10		Machine Bolt, 1/2" x 1-1/4"
	10		Anco Lock Nut, 1/2"
5.	10	D-830-21 W	Flight
	30		Machine Bolt, 1/2" x 1-1/4"
	30		Anco Lock Nut, 1/2"

DRUM DRIVE IDLER

(B/M 831-124-A)

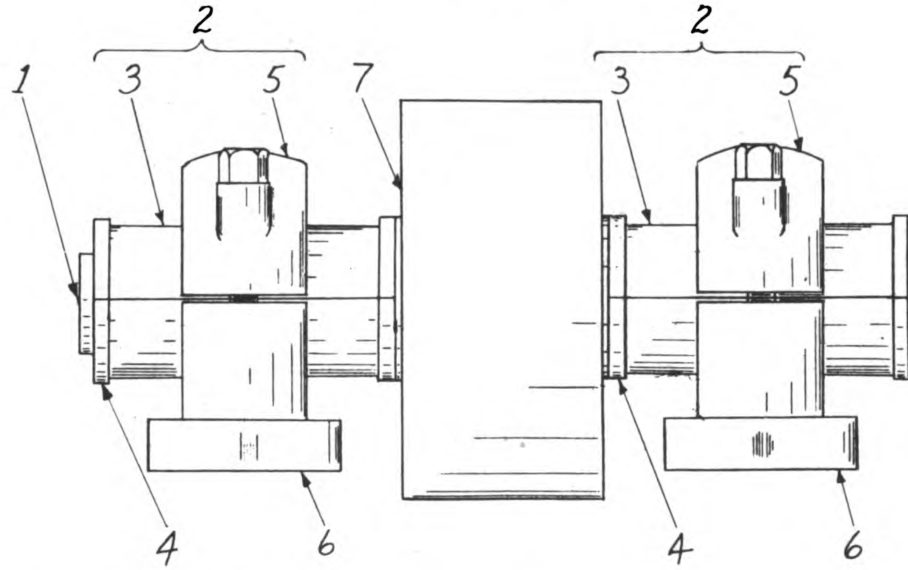


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	E-831-124 W	Take Up Arm
	8	Q-17-9	Washer
	2	GG-17-9	Washer
	2		Cotter, 1/8" x 1-1/2"
2.	1	2991-A	Sprocket, 9-Tooth
	2	B-8-54	Bronze Bushing
3.	2	0-831-124	Bracket Half
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
4.	1	A-831-124	Screw Arm
	2		Hex Nut, 3/4"
5.	1	E-830-16 W	Take Up Shaft
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		Street Elbow, 1/4"
	1		1/4" Hydraulic Alemite, Male
	2	DP-17-9	Washer
	1		Cotter, 1/4" x 2"
6.	1	G-830-16 W	Spring Seat
7.	1	B-46-63	Spring

Always give Serial Number of Machine, Parts Number and Description.

TRUNNION ROLLERS (Engine Side)

(B/M 830-14-C)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	A-830-14	Shaft, 1-15/16" x 1' 4-3/4" S.A.E.1045
2.	4	13-213-K	Ball & Socket Bearing (Complete)
	8		Machine Bolt, Nut, & Jam nut 5/8" x 5-3/4"
3.	4	1462 D	Bearing Upper Half
			Grease Piping, Hopper End Roller
	2	AF-17-43	Pipe, 1/4" x 2-1/2"
	6		Elbow, 1/4" x 90°
	2	I-17-43	Pipe, 1/4" x 3"
	2	B-17-120	Pipe, 1/4" x 9"
	2	D-17-120	Pipe, 1/4" x 2' 10-1/2"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
			Grease Piping, Burner End Roller
	2	AF-17-43	Pipe, 1/4" x 2-1/2"
	6		Elbow, 1/4" x 90°
	2	I-17-43	Pipe, 1/4" x 3"
	2	B-17-120	Pipe, 1/4" x 9"
	2	AE-17-43	Pipe, 1/4" x 2' 6"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
4.	4	1462 A	Bearing Lower Half
5.	4	822 B	Bearing Cap
6.	4	823	Bearing Base
	8		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 3"
	8		Bevel Washer, 5/8"
	12	AY-17-109	Shim, 16 Ga.
	8	QQ-17-111	Shim, 1/4"

Trunnion Rollers (Engine Side) (Continued)

(B/M 830-14-C)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	8	SS-17-111	Shim, 12 Ga.
	16	TT-17-111	Shim, 16 Ga.
	8		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
7.	2	3706	Roller
	4		Set Screw, 1/2" x 1-1/2"

T R U N N I O N   R O L L E R S (Opposite Engine Side)

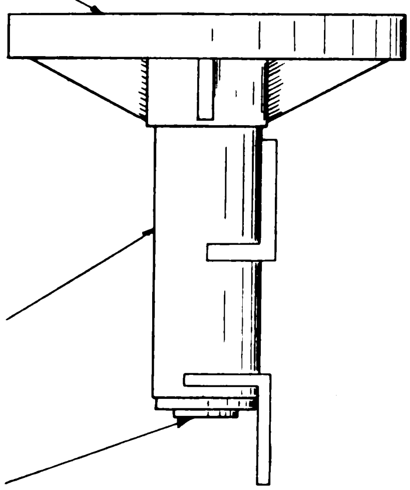
(B/M 830-14-C)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	A-830-14	Shaft, 1-15/16" x 1' 4-3/4", S.A.E. 1045
2.	4	13-213-K	Ball & Socket Bearing (Complete)
	8		Machine Bolt, Nut, & Jam nut 5/8" x 5-3/4"
3.	4	1462-D	Upper Bearing Half
	4	AF-17-43	Pipe, 1/4" x 2-1/2"
	4		Elbow, 1/4" x 90°
	4		1/4" Hydraulic Alemite, Male
4.	4	1462-A	Lower Bearing Half
5.	4	822 B	Bearing Cap
6.	4	823	Bearing Base
	8		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 3"
	8		Bevel Washer, 5/8"
	12	AY-17-109	Shim, 15 Ga.
	8	QQ-17-111	Shim, 1/4" Plate
	8	SS-17-111	Shim, 12 Ga.
	16	TT-17-111	Shim, 16 Ga.
	8		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
7.	2	3706	Roller
	4		Set Screw, 1/2" x 1-1/2"

Always give Serial Number of Machine, Parts Number and Description.

T H R U S T   R O L L E R S

(B/M 830-19-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	3707	Wheel
2.	2	A-830-19 WB	Bearing Bracket
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/2"
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
	8	CK-17-111	Shim, 1/4" Plate
	8	CM-17-111	Shim, 12 Ga.
	16	CN-17-111	Shim, 16 Ga.
	4	FE-17-9	Washer
	2	FC-17-9	Washer
	2		Street Elbow, 1/4" x 90°
	2	F-17-120	Pipe, 1/4" x 1' 7"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
3.	2	F-830-19-W	Shaft

COMBUSTION CHAMBER REFRACTORY

(B/M 830-24-A1)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	K-830-24	Asbestos Lining
	8	J-830-24	Asbestos End
		RE-PD-A1	600 lb. Castable Refractory

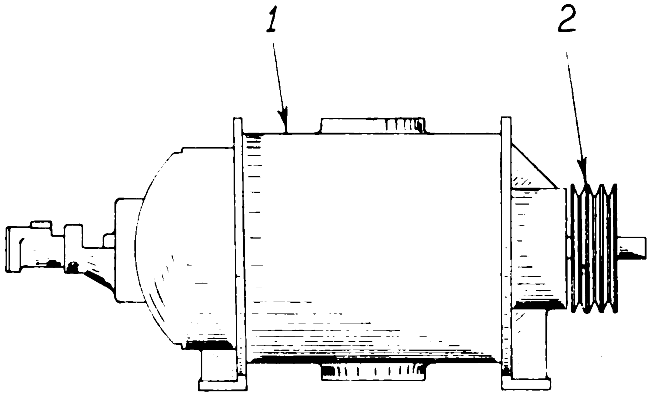
COMBUSTION CONE REFRACTORY

(B/M 830-104-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
		RE-PD-A1	125 lb. Castable Refractory

BLOWER AND OIL PUMP

(B/M 830-95-A)

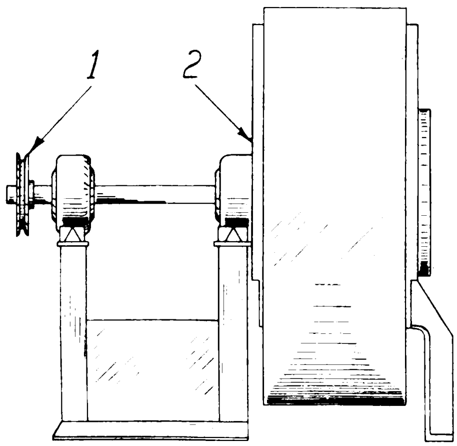


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	BL-RC-D1	Blower, Roots-Connersville, #615 4" Victor Acme Blower with 3/8" Viking oil pump, and 2-1/2" weighted air relief valve (See Accessory Section)
	4		Machine Bolt, Nut, & Lock Washer & Cut Washer, 5/8" x 2"
	4		Bevel Washer, 5/8"
	2	AF-17-28	Stop Block
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
	1	C-831-203	Relief Valve Lock Bar
2.	1	PL-PY-A1	Pulley
	1		Allen Cup Point Safety Set Screw, 3/8" x 1-1/4"
	1		Allen Cup Point Safety Set Screw, 3/8" x 1-1/2"

EXHAUSTER FAN

(B/M 830-96-A)

See Parts List on following page.



Exhauster Fan (Continued)

(B/M 830-96-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PL-PY-B1	Pulley
	2		Allen Cup Point Safety Set Screw, 5/16" x 3/4"
	1	00-17-32	Key, 3/8" x 3/8" x 1-1/4"
2.	1	FA-CL-A1	Exhauster Fan, Clarage #15 (See Accessory Section)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	6		Bevel Washers, 1/2"

FAN V-BELT IDLER

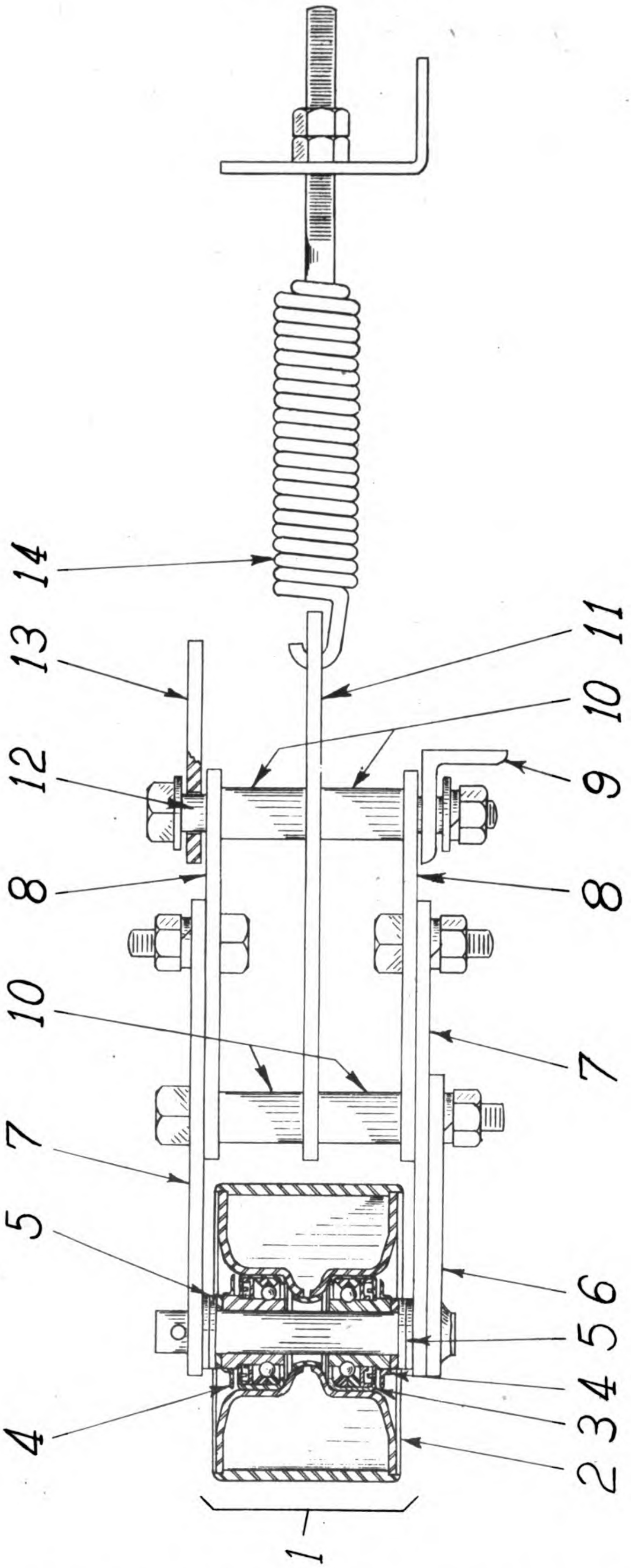
(B/M 831-193-A)

See Illustration on following page.

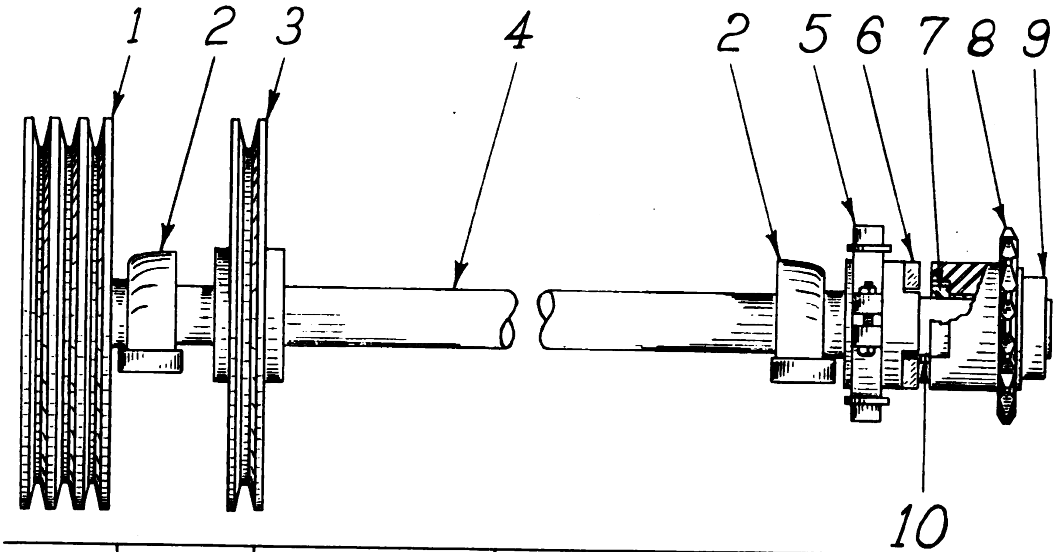
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	(B/M 14-148-E)	Roll (Complete)
2.	1	(B/M 14-148-E) Machine & Welded Unit #1	Roller
3.	2	BR-SC-A1	Schatz Ball Bearing
4.	2	B-14-139	Seal
5.	6	Z-14-72	Washer
6.	1	J-831-193-W	Pin
	1		Cotter, 1/4" x 1-1/2"
	1		1/8" Hydraulic Alemite, Male
7.	2	A-831-193	Upper Side Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
8.	2	B-831-193	Lower Side Bar
	2		Machine Bolt, Nut, & Lock Washer, & two Cut Washers, 1/2" x 5-1/2"
9.	1	E-831-193	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Bevel Washer, 1/2"
10.	4	J-17-11	Pipe Spacer
11.	1	C-831-193	Center Bar
12.	2	B-17-10	Pipe Spacer
13.	1	F-831-193	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
14.	1	B1-46-87	Spring & Bolt
	2		Hexagonal Nut, 1/2"

Fan V-Belt Idler (Continued)

(B/M 831-193-A)



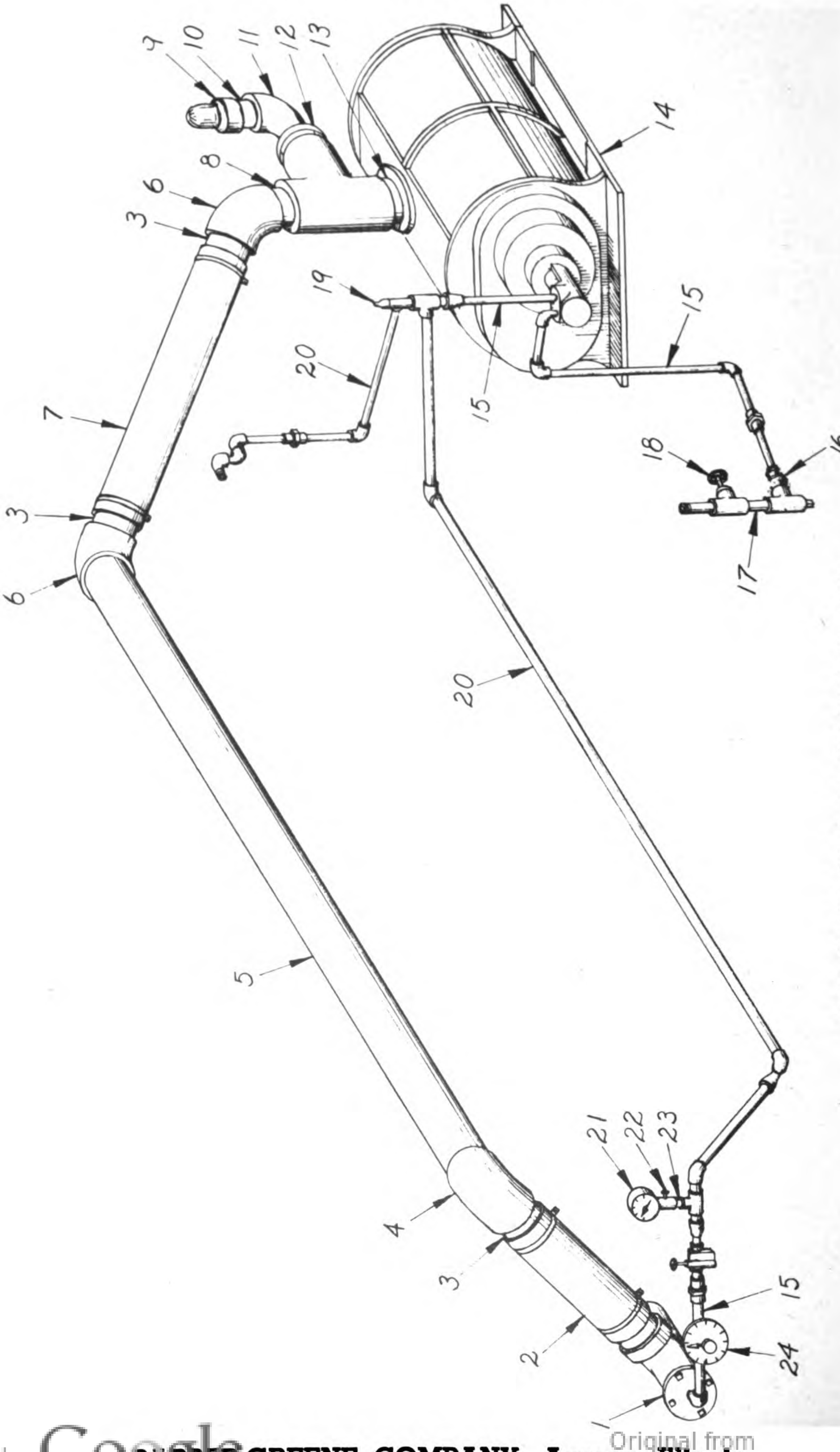
BLOWER JACK SHAFT
(B/M 831-121-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PL-PY-C2	Pulley
	1	B-17-32	Key, 3/8" x 3/8" x 2"
	2		Allen Cup Point Safety Set Screw, 3/8" x 1-1/4"
2.	2	BR-F-01	Ball Bearing, 1-7/16" Fafnir LAK Type
	4	BA-17-109	Shim, 16 Ga.
	4	BC-17-109	Shim, 12 Ga.
	4		Bevel Washer, 1/2"
	4		Machine Bolt, Nut, & Lock Washer, & two Cut Washers, 1/2" x 2-1/2"
	1		1/8" Hydraulic Alemite, Male
	1	A-17-119	Pipe, 1/8" x 3/4"
	1	BO-17-43	Pipe, 1/8" x 6"
	1		1/8" x 90° Hydraulic Alemite, Male
	2		Elbow, 1/8" x 90°
	4	M-17-28	Stop Shim, 1/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
3.	1	PL-PY-C1	Pulley
	2		Allen Cup Point Safety Set Screw, 3/8" x 1-1/4"
	1	B-17-32	Key, 3/8" x 3/8" x 2"
4.	1	A-831-121	Shaft, 1-7/16" x 4' 10-5/8" S.A.E. 4140
5.	1	2438	Shifter Yoke
	1		1/4" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
6.	1	A-3-1182	Jaw Clutch
7.	1	B-3-936	Collar
8.	1	A-19-858 W	Sprocket, 16-Tooth
	1	N-8-32	Bronze Bushing
	1		1/8" Hydraulic Alemite, Male
9.	1	FF-3-935	Collar
	2		Set Screw, 3/8" x 1"
10.	1	AM-17-107	Feather Key, 3/8" x 3/8" x 3"

831 P I P I N G

(B/M 831-204-A,B,C,D,&E)



See Parts List on following page.

831 Piping (Continued)

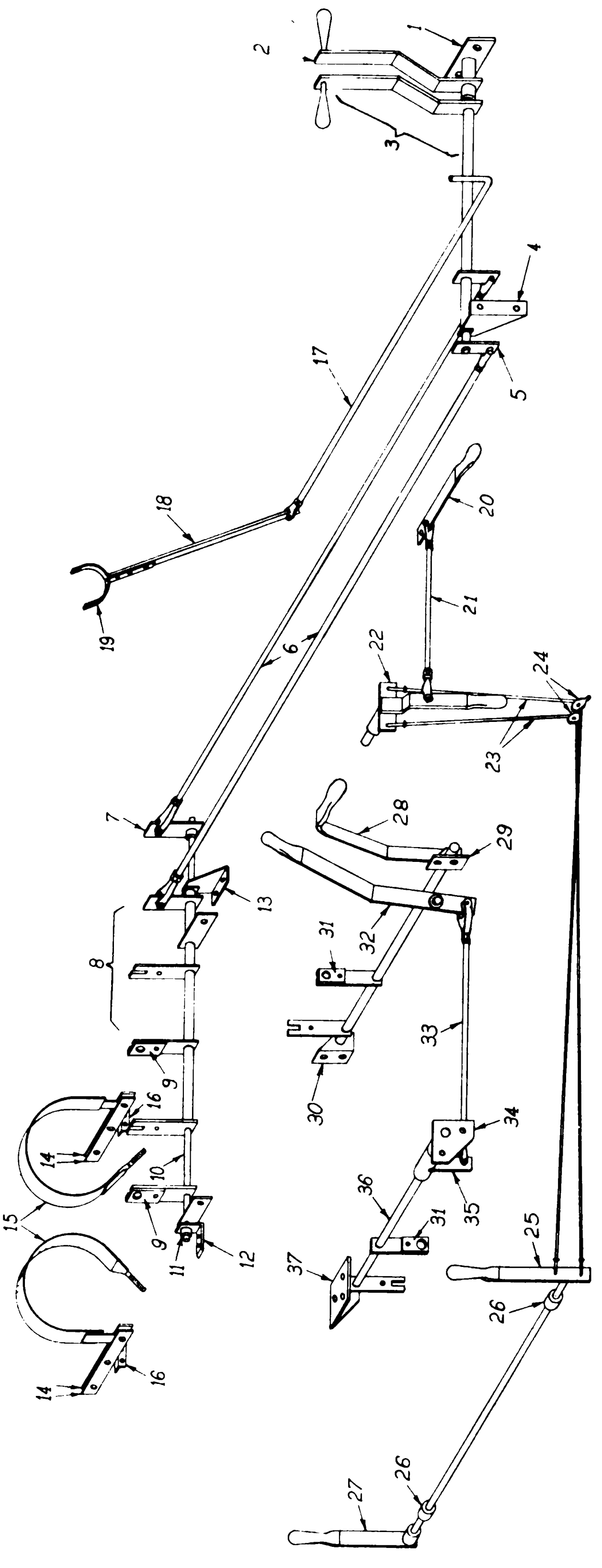
(B/M 831-204-A,B,C,D,&E)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	BU-HA-F1	Hauck Oil Burner #583 (See Accessory Section)
2.	1	B-831-203	Hose, 4-1/2" x 1' 2-5/8"
	2		Hose Clamps, 4-1/2"
3.	3	B-17-130	Pipe, 4" x 4"
4.	1		Elbow, 4" x 90°
5.	1	J-17-130	Pipe, 4" x 6' 4-1/2"
6.	2		Elbow, 4" x 45°
7.	1	A-831-203	Hose, 4-1/2" x 2' 3"
	2		Hose Clamps, 4-1/2"
8.	2	E-17-130	Pipe, 4" x 3"
9.			Air Relief Valve, (See Accessory Section)
10.	1	A-17-128	Pipe, 2-1/2" x 2-1/2"
11.	1		Street Elbow, 2-1/2" x 90°
12.	1		Reducing Bushing, 4" x 2-1/2"
13.	1		Tee, 4" x 4" x 4"
14.			Blower and Oil Pump (See Accessory Section
15.	1		Piping, 3/8" x 4' 6"
	2		Elbow, 3/8" x 90°
	1		Street Elbow, 3/8" x 90°
	1		Gem Union, 3/8"
16.	1	CC-879-240 A	Strainer
17.	1		Piping, 3/4" x 5"
	1		Tee, 3/4" x 3/4" x 3/4"
	1		Pipe Plug, 3/4"
18.	1		Gate Valve, 3/4"
19.	1	PF-RV-C1	Oil Relief Valve, 1/2" Fulflo No. VB-3
20.	1		Piping, 1/2" x 11' 0"
	4		Elbow, 1/2" x 90°
	5		Street Elbow, 1/2" x 90°
	1		Tee, 1/2" x 1/2" x 1/2"
	1		Tee, 1/2" x 1/2" x 1/4"
	1		Gem Union, 1/2"
	1		Reducing Bushing, 1/2" x 3/8"
	1		Reducing Coupling, 1/2" x 3/8"
21.	1	PF-PG-B1	Pressure Gauge.
22.	1	PF-GC-A1	Gauge Cock, 1/4".
23.	1		Pipe, 1/4" x 7/8"
24.	1	VA-HA-C1	Hauck Micro Valve, 3/8" (See Accessory Section)
	1	A-17-122	Pipe, 1/2" x 1-1/8"

Always give Serial Number of Machine, Parts Number and Description.

CONTROL LEVERS

See Parts List on following page.



Control Levers (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	Y-831-176 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
2.	1	AA-831-176 W	Lever (Drag Scoop)
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 3/4"
	1		Set Screw, 3/8" x 1"
3.	1	P-831-176 W	Lever (Drag Scoop)
4.	1	J-831-177 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
5.	1	T-831-176-W	Lever Arm
6.	2	AH-17-144	Rod
	4	B-3-149	Yoke End
	4	C-17-23	Rivet
	4		Hex Nut, 3/4"
	4		Cotter, 1/8" x 1"
7.	1	O-831-177-W	Lever
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 3/4"
	1		Set Screw, 3/8" x 1"
8.	1	J-831-176 W	Shifter
9.	2	F-3-1028	Retainer
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 3/8" x 1-1/4"
10.	1	D-831-176-W	Shifter
11.	1	C-3-951	Collar
	1		Set Screw, 3/8" x 5/8"
12.	1	W-831-176 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 2-1/4"
	2		Bevel Washer, 1/2"
	2	BJ-17-139	Shim, 1/4"
13.	1	V-831-177-W	Bracket
	2		Machine Bolt, Nut, & Lock Washer & Cut Washer, 1/2" x 2-1/4"
	1		Bevel Washer, 1/2"
	4	T-831-177	Shim, 1/4"
14.	4	K-831-177	Bar
	6	B-17-10	Pipe Spacer
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
15.	2	D-831-177 R	Brake Bands
	4		Hex Nut, 1/2"
16.	2	G-831-177 W	Bracket
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"

Control Levers (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
17.	1	C-831-190	Lever Rod (Feeder)
	1	B-3-149	Yoke End
	1	C-17-23	Rivet
	1		Cotter, 1/8" x 1"
	1		Hex Nut, 3/4"
18.	1	A-831-190	Lever Arm
19.	1	B-831-190	Shifter Side Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1	Y-17-23	Rivet
	1		Cotter, 1/8" x 1"
20.	1	F-831-181	Lever (Master Clutch Remote Control)
	1	B-17-10	Pipe Spacer
	1		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-3/4"
21.	1	DD-17-144	Rod, 3/4" x 3' 2-1/2"
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
22.	1	D-831-181 W	Lever (Master Clutch Remote Control)
	1		Key, Woodruff No. A
	1		Set Screw, 3/8" x 5/8"
	1		Set Screw, 3/8" x 7/8"
23.	2		Cable, 1/4" x 13' 0"
	4		Cable Thimble, 1/4"
	4		Cable Clamp, 1/4"
24.	2		Fast Eye Block, #9
	2		"U" Bolt, 5/16"
	8		Hex Nut, 5/16"
25.	1	M-831-181 W	Lever (Master Clutch Remote Control)
26.	2	B-3-932	Collar
	4		Set Screw, 3/8" x 3/4"
27.	1	H-831-181 W	Lever (Master Clutch Remote Control)
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	2		Set Screw, 3/8" x 3/4"
28.	1	Q-831-189 W	Lever Shaft (Fan and Blower)
29.	1	S (L) 831-189	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
30.	1	S (R) 831-189	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
31.	2	K-3-1122	Retainer
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"

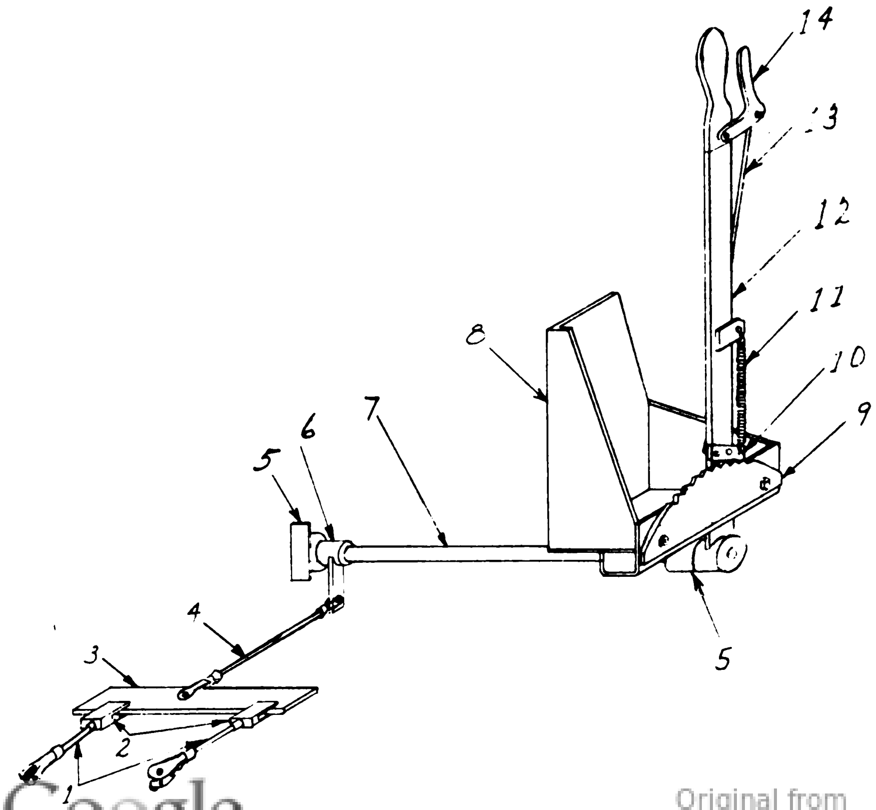
Control Levers (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
32.	1	K-831-189	Lever (Drum Drive)
	1	AC-17-11	Pipe Spacer
	1		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
33.	1	ZZ-17-144	Rod
	2	B-3-149	Yoke End
	2	C-17-23	Rivet
	2		Cotter, 1/8" x 1"
	2		Hex Nut, 3/4"
34.	1	U-831-189-W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
35.	1	F-831-189 W	Lever Arm
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 5/8"
	1		Set Screw, 3/8" x 3/4"
36.	1	J-831-189 W	Shifter Shaft
37.	1	A-831-189 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"

PARKING BRAKE CONTROL

(B/M 831-158-A)

See Parts List on following page.



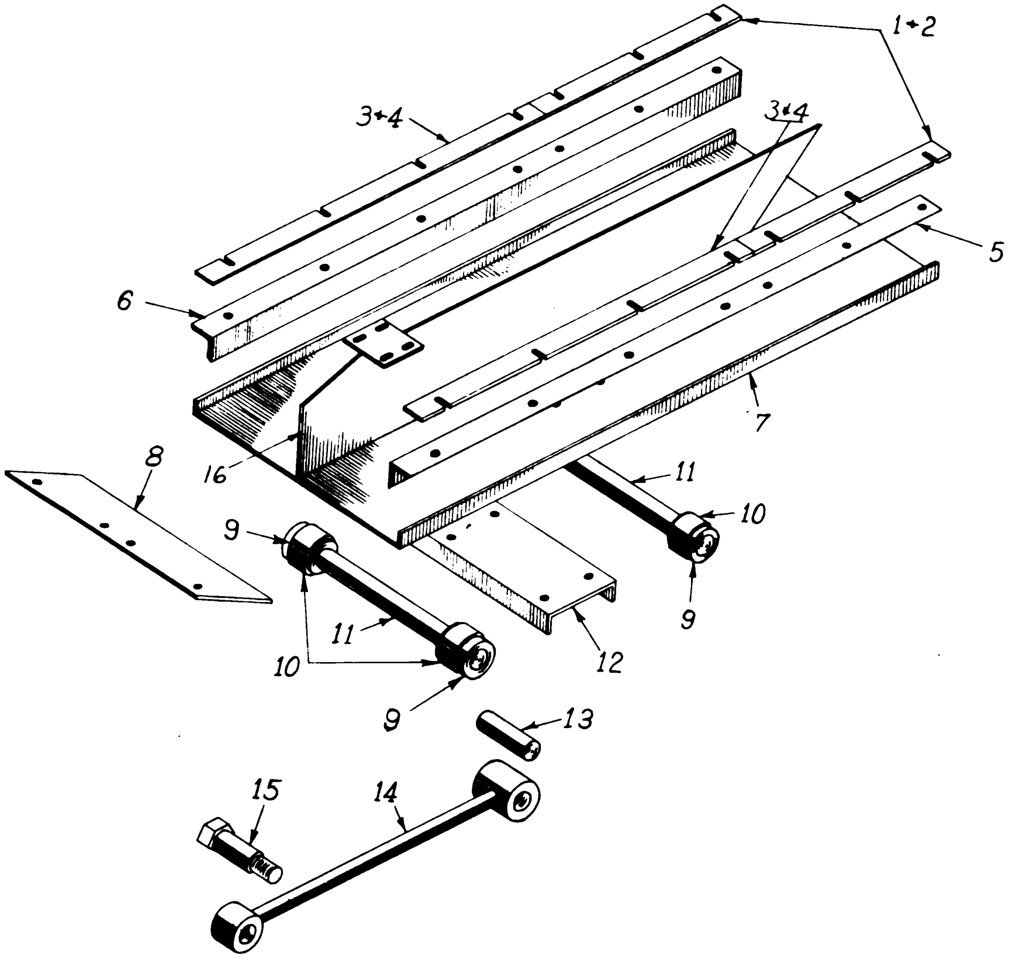
Parking Brake Control (Continued)

(B/M 831-158-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	CQ-17-144	Rod
	2	A-3-604	Yoke End
	2		Hex Nut, 1/2"
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
2.	2	V-831-159 W	Yoke End
	2		Hex Nut, 1/2"
	2	C-17-23	Rivet
	4		Cut Washer, 1/2"
	2		Cotter, 1/8" x 1"
3.	1	S-831-159	Equalizer
4.	1	BV-17-144	Rod
	2	A-3-604	Yoke End
	2		Hex Nut, 1/2"
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
5.	2	1383 E	Solid Bearing
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-1/2"
	2		1/8" Hydraulic Alemite, Male
	4	DO-17-139	Shim, 16 Ga.
6.	1	G-3-1032 W	Lever Arm
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 3/8"
	1		Set Screw, 3/8" x 7/8"
7.	1	X-831-159	Shaft, 1-1/4" x 4' 5-7/16", S.A.E. 1020
8.	1	D-831-159 W	Bracket
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Bevel Washers, 1/2"
9.	1	M-3-1197	Ratchet
	4	DM-17-9	Bevel Washer, 5/8"
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
10.	1	F-3-1197	Latch
	1	B-17-10	Pipe Spacer
	1	H-3-1197	Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 2"
	1	J-3-1197	Bar
	1	K-3-1197	Bar
11.	1	D-46-154	Spring
	2		Round Head Stove Bolt, Nut, & Lock Washer, 1/4" x 3/4"
12.	1	B-3-1197 W	Lever
	1	E-17-30	Key, 1/4" x 1/4" x 2"
	1		Set Screw, 3/8" x 1/2"
	1		Set Screw, 3/8" x 7/8"
13.	1	G-3-1197	Rod
	2		Cotter, 3/32" x 1"
14.	1	G-62-33	Grip Latch
	1	DC-17-23	Rivet
	1		Cotter, 1/32" x 1"

RECIPROCATING FEEDER

From (B/M 831-133-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	4	M-830-56	Shim, 12 Ga.
2.	6	N-830-56	Shim, 16 Ga.
3.	4	O-830-56	Shim, 12 Ga.
4.	6	P-830-56	Shim, 16 Ga.
5.	1	G (R) 830-56	Skirt
	7		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
6.	1	G (L) 830-56	Skirt
	7		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
7.	1	A-831-130 W	Feeder Pan
8.	1	X-831-130	Back Plate
	4		Flat Head Cap Screw, Nut, & Lock Washer, & Cut Washer, 3/8" x 1-1/4"
9.	4	NN-3-935	Collar
	8		Set Screw, 3/8" x 1"
10.	4	E-3-1097	Roller
	4	H-8-32	Bronze Bushing
11.	2	J-830-57	Shaft, 1-7/16" x 1' 7-1/8", S.A.E. 4140
	4		1/8" x 30° Hydraulic Alemite, Male
	4	DG-17-9	Washer

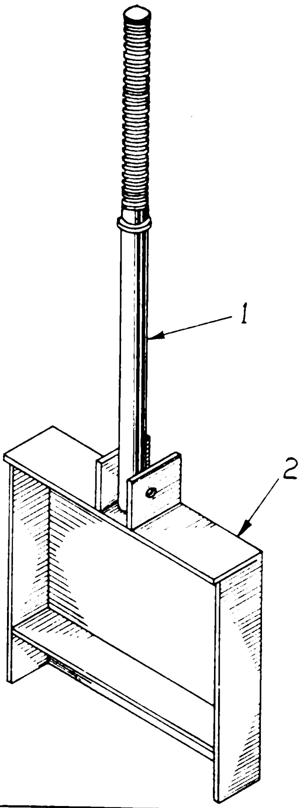
Reciprocating Feeder (Continued)

From (B/M 831-133-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
12.	1	H-831-130 W	Feeder Pan Bracket
	4		Flat Head Cap Screw, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	8	MW-17-9	Shim Washer, 16 Ga.
13.	1	D-830-57	Shaft, 1-7/16" x 4-3/8", S.A.E. 4140
	1		1/4" Hydraulic Alemite, Male
14.	1	C-830-57 W	Connecting Rod
	1		1/4" Hydraulic Alemite, Male
	2	D-8-35	Bronze Bushing
15.	1	H-834-69 W	Crank Pin
	1	CF-17-9	Washer
	1		Half Nut, 1-1/4"
16.	1	D-831-131 W	Divider Plate

RECIPROCATING FEEDER GATES

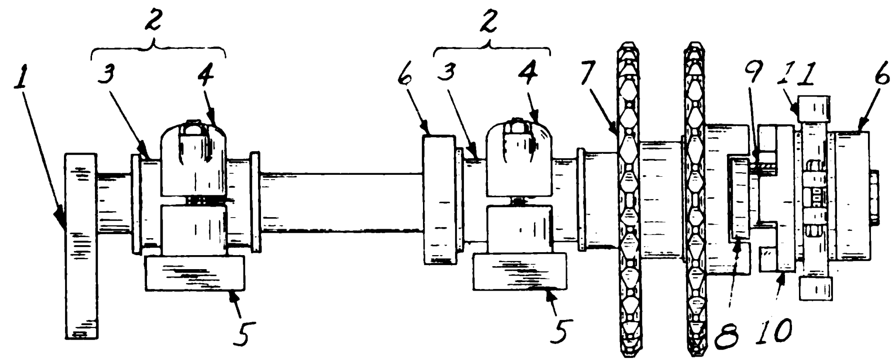
From (B/M 831-133-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	N-831-130 W	Take-Up Screw
	4		Hex Nut, 1"
	2		Machine Bolt, 3/8" x 2-1/2"
	4		Hex Nut, 3/8"
2.	2	G-831-130 W	Gate

FEEDER CRANK SHAFT

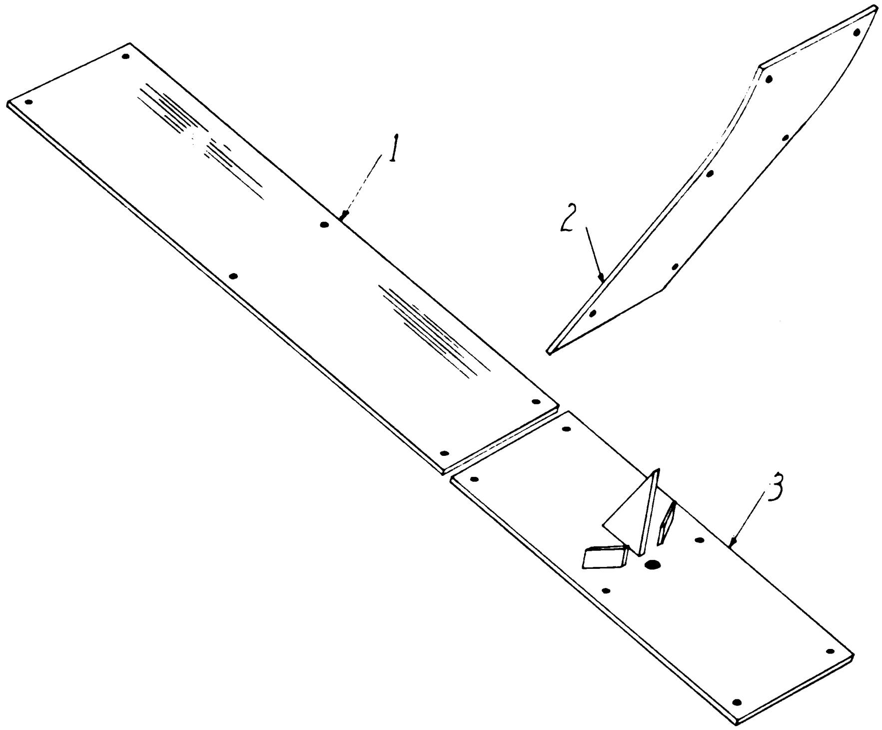
(B/M 831-120-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-831-120 W	Crank Shaft
2.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
3.	2	3567	Bearing
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Elbow, 1/4" x 90°
			1/4" Hydraulic Alemite, Male
4.	2	822 A	Bearing Cap
5.	2	821	Bearing Base
	4	QQ-17-111	Shim, 1/4" x 2-1/2" Bar
	8	TT-17-111	Shim, 16 Ga.
	4	SS-17-111	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/2"
6.	2	C-3-938	Collar
	2		Allen Cup Point Safety Set Screw, 1/2" x 3/4"
7.	1	D-19-807 W	Double Sprocket, 29-Tooth
	1		1/8" Hydraulic Alemite, Male
	2	M-8-55	Bronze Bushing
8.	1	G-3-938	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
9.	1	AE-17-107	Feather Key, 3/8" x 3/8" x 3-1/2"
10.	1	2864 E	3 Jaw Clutch
11.	1	2427	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
	1		1/8" Hydraulic Alemite, Male

D I S C H A R G E   C H U T E   L I N E R S

From (B/M 831-128-A)



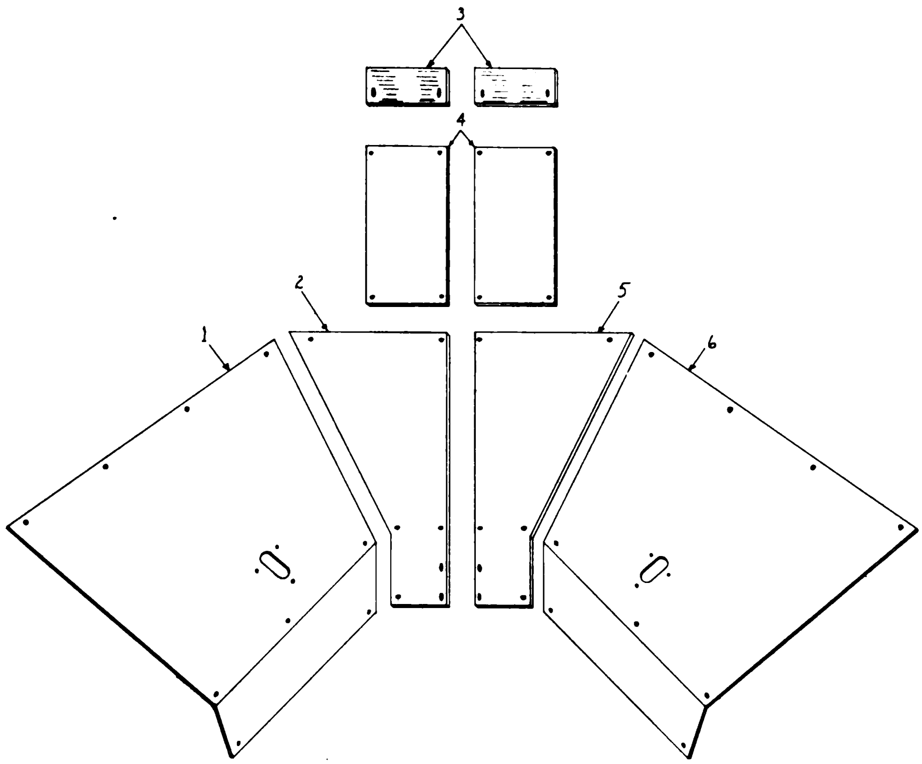
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	J-831-128	Liner Plate
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
2.	1	K-831-128	Liner Plate
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
3.	1	P-831-128-W	Liner Plate
	6		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"

MISCELLANEOUS PARTS

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	AN-46-20	Alemite Gat Gun
	1	AP-46-20	Hydraulic Extension Adapter

HOPPER LINERS AND SCRAPERS

(B/M 831-194-A)

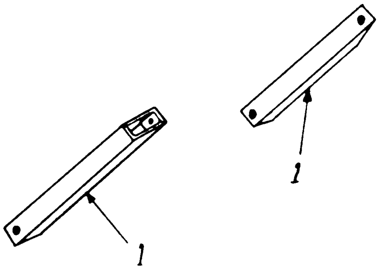


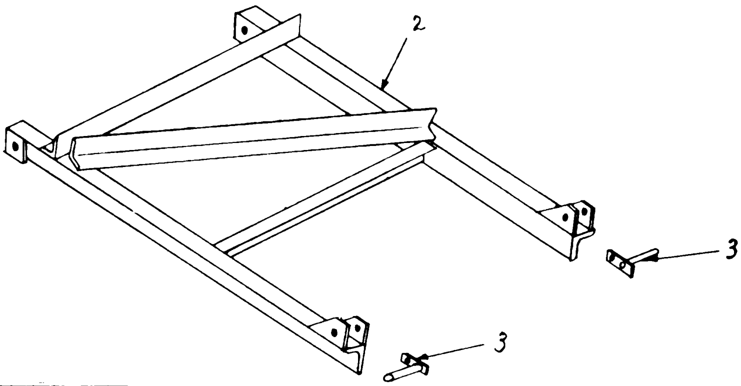
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B (L) 831-198	Hopper Liner (Opposite Engine Side)
	5		Flat Head Cap Screw, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	3		Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	1		Machine Bolt, Nut, Lock Washer & Cut Washer, 3/8" x 1"
2.	1	A (L) 831-198	Hopper Liner (Opposite Engine Side)
	3		Flat Head Cap Screw, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	2		Machine Bolt, Nut, Lock Washer & Cut Washer, 3/8" x 3/4"
3.	2	E-831-198	Scraper, 4 PLY Belting
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
4.	2	K-831-198	Chute Liner
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
5.	1	A (R) 831-198	Hopper Liner (Engine Side)
	3		Flat Head Cap Screw, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"

Hopper Liners and Scrapers (Continued)
(B/M 831-194-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	1	B (R) 831-198	Hopper Liner (Engine Side)
	5		Flat Head Cap Screw, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	3		Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 3/4"
	1		Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 1"

PUSH ARMS
(B/M 831-207-A)





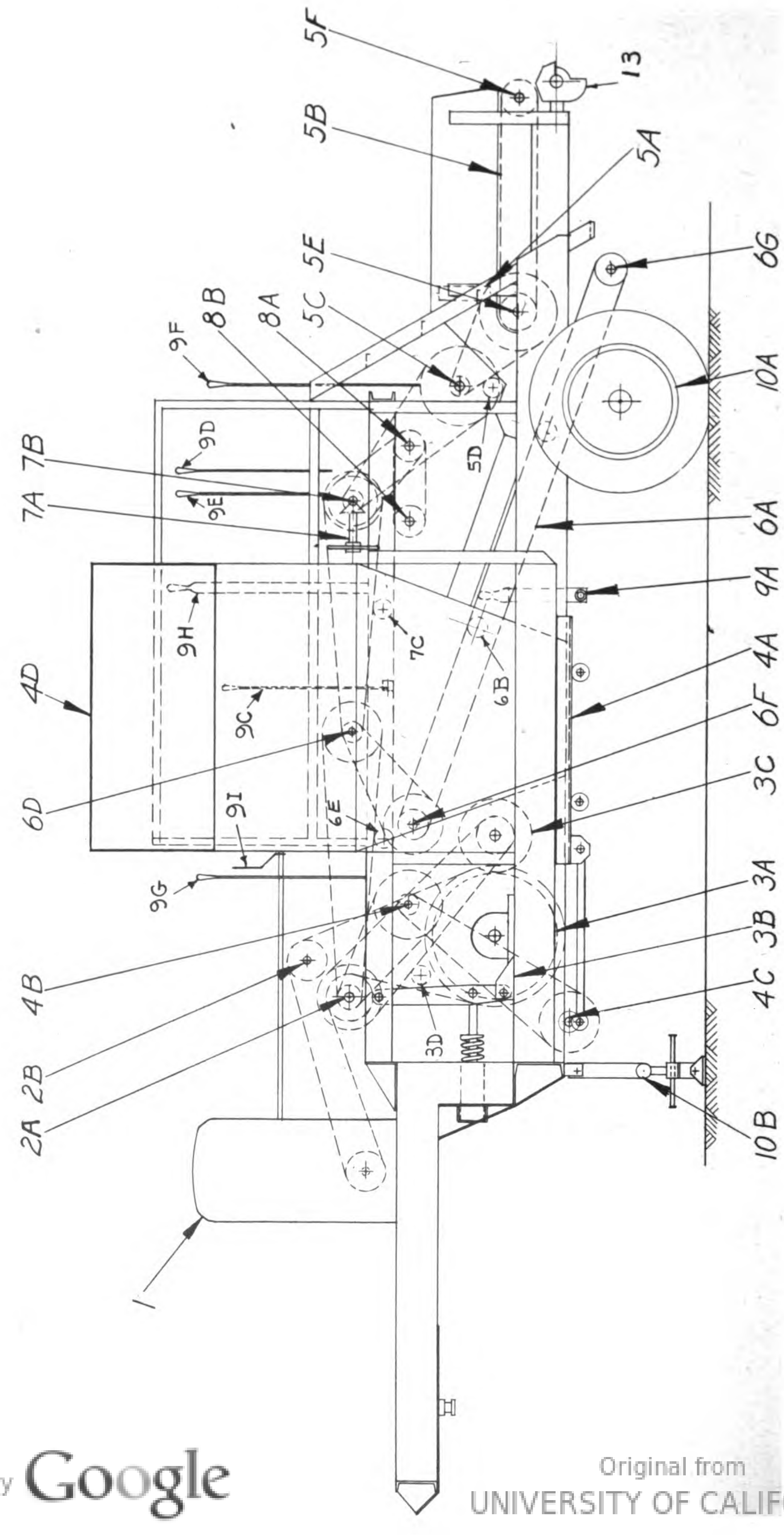
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	N-831-207 W	Push Arm
	2		Machine Bolt, Nut, & Lock Washer, 3/4" x 3-1/4"
	2		Machine Bolt, Nut, & Lock Washer, 3/4" x 2-1/4"
2.	1	G-831-207 W	Push Arm
	1	A-831-207	Shaft, 3/4" x 6-1/4", S.A.E. 1020
	2		Cotter, 1/4" x 1-1/2"
	4		Cut Washer, 3/4"
	1		Machine Bolt, Nut, & Lock Washer, 3/4" x 2-1/4"
	1	Q-831-207 W	Bracket
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
3.	2	K-831-207 W	Pin
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"

THERMOMETER

(B/M 831-191-B)

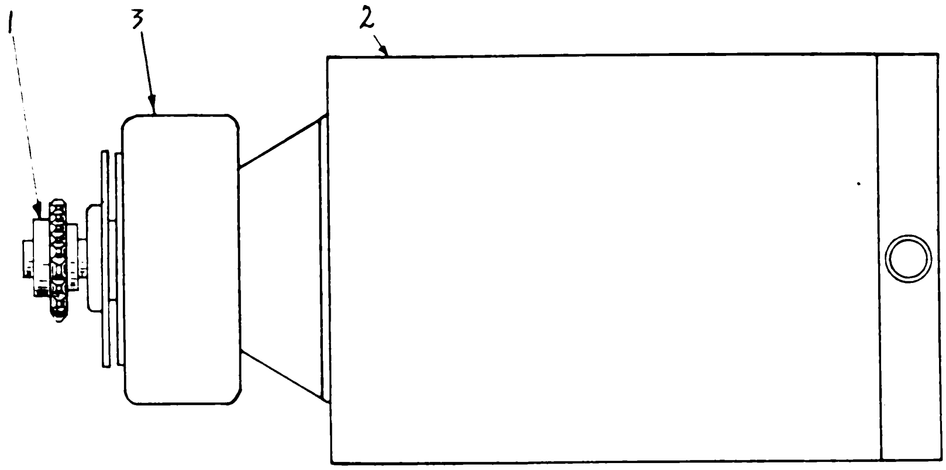
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	H-831-191	Housing Support
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	4	F-38-144	Clamp
	1	TH-EA-A1	Motoco Dial Thermometer 50° to 550°F.
	1	E-833-105W	Housing
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	2		Shakeproof Thread Cutting Screw, Right Hand, #10-24 x 1/4"
	1	G-833-105	Thermometer Support
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
	1	PA-PD-A1	1-1/2" Padlock With Chain Attached, Type "I"

Barber-Greene Model 821 Soils Unit



CONTENTS

POWER UNIT
(B/M 840-25-B)

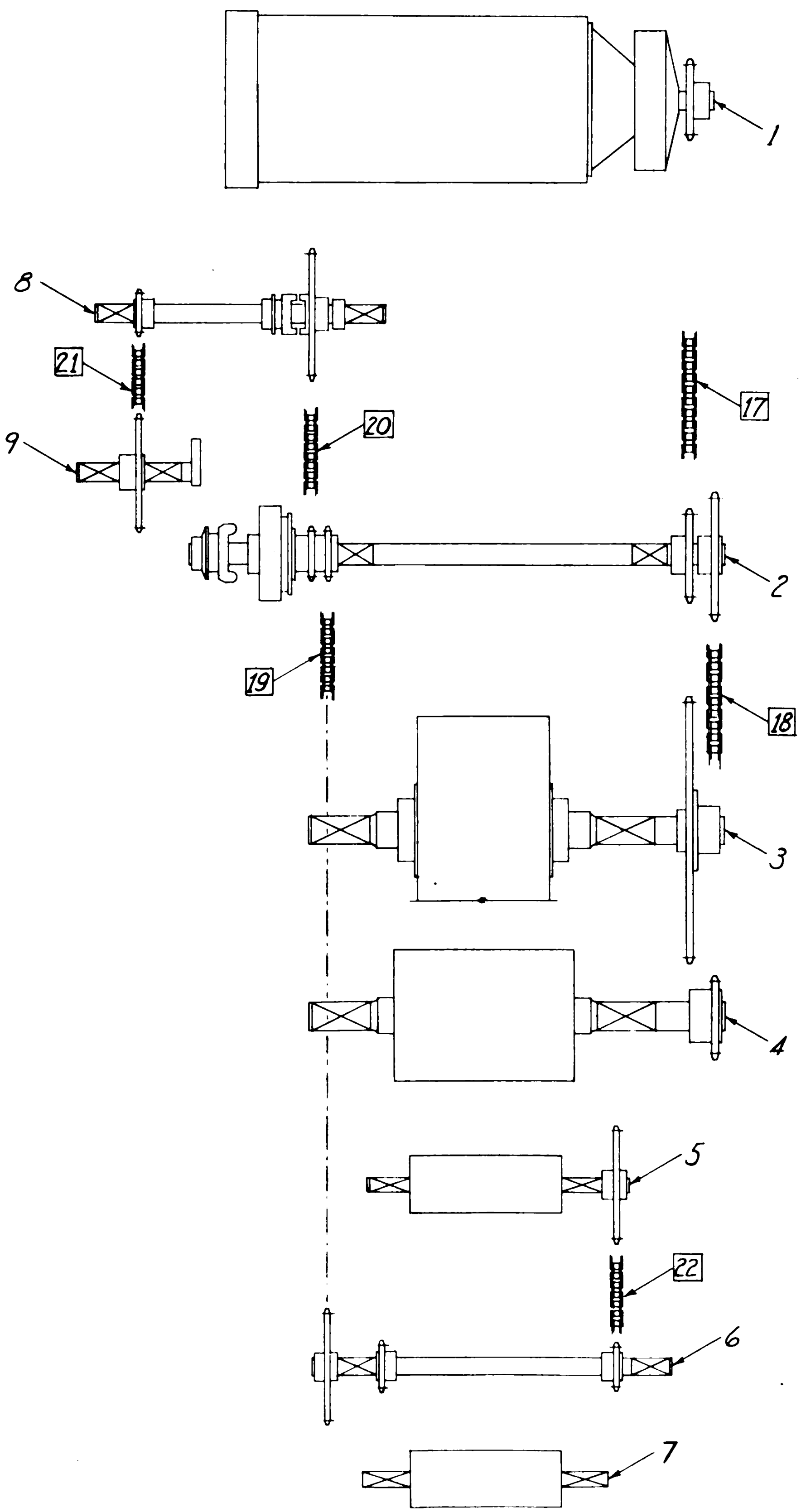


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	19-601-P	Sprocket, 19-Tooth
	1	B-17-33	Key, 1/2" x 1/2" x 3"
2.	1	EN-L-A11	LeRoi Power Unit D201P3 (For Details See Accessory Section)
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-3/4"
	2		Flat Head Cap Screw, Nut, & Lock Washer, 5/8" x 2-3/4"
	4	KE-17-9	Sheared Cut Washer
	4	VV-17-109	Shims, 16 Ga.
	2	BD-17-24	Take-Up Bolt, 3/4" x 4-1/4"
	5		Hex Nut, 3/4"
	4		Machine Bolt, Nut, Lock Washer, & two Cut Washers, 5/8" x 2"
	4		Bevel Washer, 5/8"
3.	1	SR-L-A1	Reducer & clutch, LeRoi #2C-13-33-11 for D201 Engine (for details see accessory section).

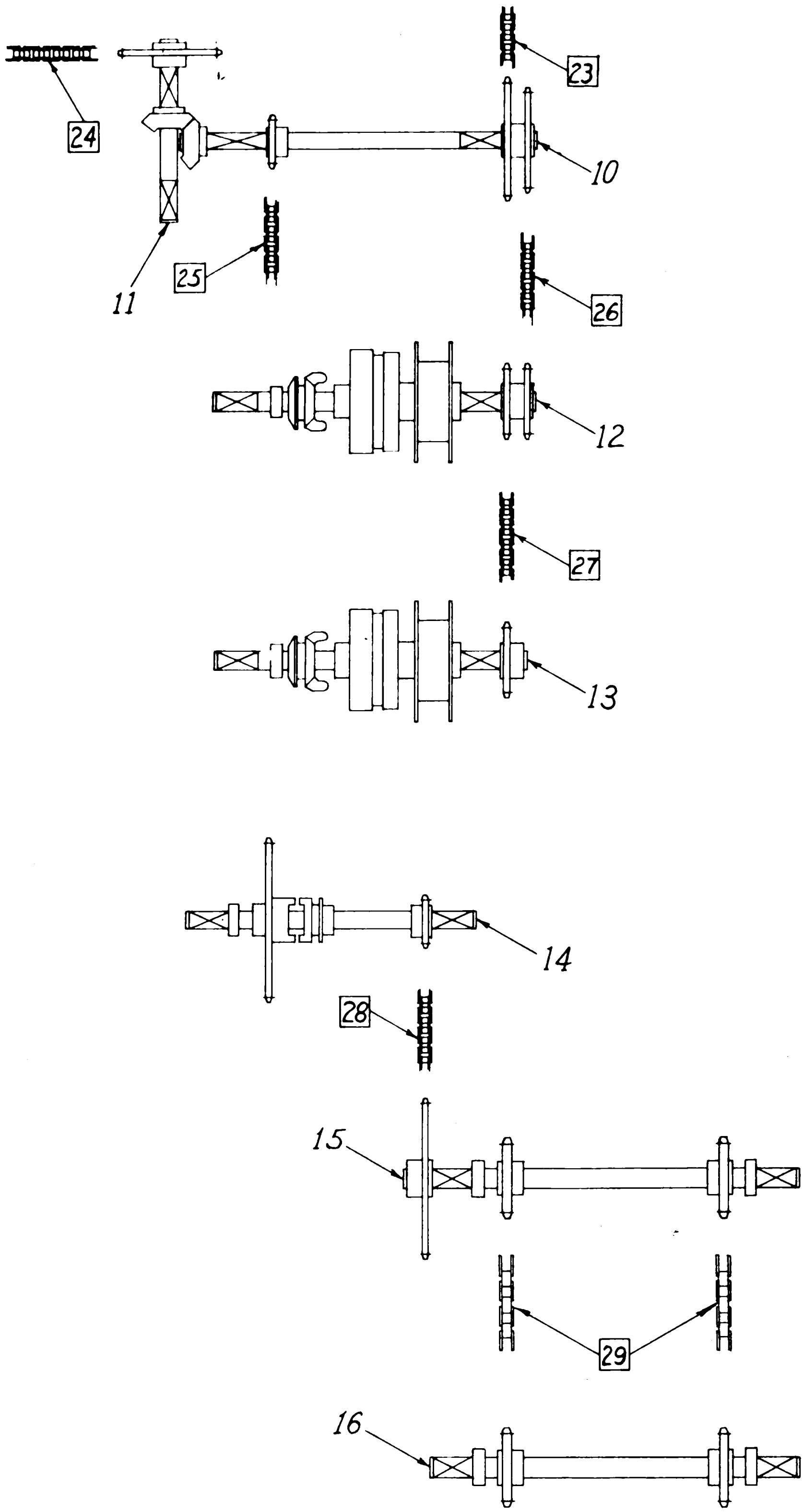
MISCELLANEOUS PARTS

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	AN-46-20	Alemite Gat Gun
	1	AP-46-20	Hydraulic Extension Adapter

821 DRIVE CHAINS



821 Drive Chains (Continued)



821 Drive Chains (Continued)

(B/M 821-176-A)

1. Engine
2. Main Jack Shaft
3. Smooth Roll Shaft
4. Cutter Roll Shaft
5. Conveyor Head Shaft
6. Conveyor Counter Shaft
7. Conveyor Foot Shaft
8. Plate Feeder Counter Shaft
9. Plate Feeder Crank Shaft
10. Bevel Gear Counter Shaft
11. Elevator Drive Shaft
12. Dragline Shaft
13. Dragline Shaft
14. Soil Feeder Counter Shaft
15. Soil Feeder Head Shaft
16. Soil Feeder Foot Shaft

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
17.	1	EW-6-64C	Strand of Diamond #470 1-1/4" P. 172 Links
18.	1	BS-6-64C	Strand of Diamond #470 1-1/4" P. 92 Links - 1 offset
19.	1	DE-6-58C	Strand of Diamond #434 1" P. 128 Links - 1 offset
20.	1	AV-6-58C	Strand of Diamond #434 1" P. 70 Links - 1 offset
21.	1	CD-6-58C	Strand of Diamond #434 1" P. 102 Links - 1 offset
22.	1	AQ-6-58C	Strand of Diamond #434 1" P. 66 Links
23.	1	CO-6-58C	Strand of Diamond #434 1" P. 114 Links
24.	1	DE-6-58C	Strand of Diamond #434 1" P. 128 Links - 1 offset
25.	1	BR-6-58C	Strand of Diamond #434 1" P. 92 Links
26.	1	AF-6-58C	Strand of Diamond #434 1" P. 54 Links - 1 offset
27.	1	ZZ-6-58C	Strand of Diamond #434 1" P. 50 Links
28.	1	AT-6-58C	Strand of Diamond #434 1" P. 68 Links - 1 offset
		A-6-64	Roller Link Diamond #470 1-1/4" P.
		B-6-64	Connecting Link Diamond #470 1-1/4" P.
		C-6-64	Offset Link Diamond #470 1-1/4" P.
		A-6-58	Roller Link Diamond #434 1" P.
		B-6-58	Connecting Link Diamond #434 1" P.
		C-6-58	Offset Link Diamond #434 1" P.

MAIN JACK SHAFT

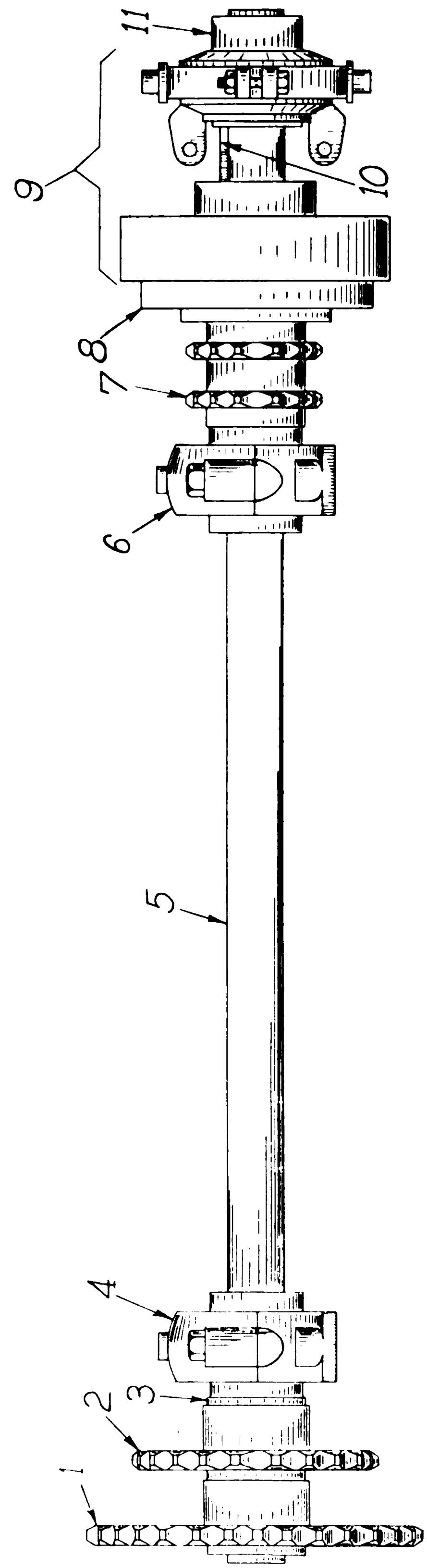
(B/M 821-13-A)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	19-601-BB	Sprocket, 31-Tooth
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
	1	UU-17-33	Key, 1/2" x 1/2" x 5-7/16"
2.	1	19-601-AA	Sprocket, 22-Tooth
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
3.	1	NN-17-9	Washer
4.	1	BR-D-E1	Roller Bearing, Dodge Timken PT-469
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 8-1/2"
	1	DP-17-139	Shim, 20 Ga.
	1	DQ-17-139	Shim, 16 Ga.
	1	DS-17-139	Shim, 12 Ga.
	2		Set Screw, 1/2" x 2"
	2		Half Nut, 1/2"
5.	1	A-821-13	Shaft, 2-3/16" x 4' 9-1/4", S.A.E. 4140

Main Jack Shaft (Continued)

(B/M 821-13-A)



Main Jack Shaft (Continued)
(B/M 821-13-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	1	BR-D-E2	Roller Bearing, Dodge Timken PT-470
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 5/8" x 3-3/4"
	2		Bevel Washer, 5/8"
	1	DP-17-139	Shim, 20 Ga.
	1	DQ-17-139	Shim, 16 Ga.
	1	DS-17-139	Shim, 12 Ga.
	2		Set Screw, 1/2" x 2"
	2		Half Nut, 1/2"
7.	1	A-19-847	Double Sprocket, 15-Tooth
	1	E-8-95	Bronze Bushing, 2-1/4"
	1	J-8-95	Bronze Bushing, 4-1/2"
	2		1/8" Hydraulic Alemite, Male
8.	1	3459	Clutch Drum
	1	W-17-33	Key, 1/2" x 1/2" x 2-5/16"
9.	1	3-1007-C	Friction Clutch, B-G 8" (See Page 530 For Details)
	1		1/8" Hydraulic Alemite, Male
10.	1	AE-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
11.	1	Q-3-944	Collar
	2		Allen Cup Point Safety Set Screw, 5/8" x 3/4"

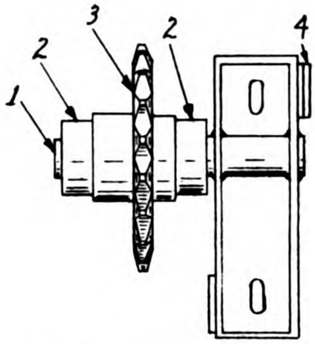
MAIN DRIVE IDLER
(B/M 821-13-B)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-821-13-W	Idler Shaft
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
	1	M-17-28	Shim, 1/4"
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
2.	2	K-3-935	Collar
	4		Set Screw, 1/2" x 3/4"
3.	1	F-19-831-W	Sprocket, 19-Tooth
	2	D-8-35	Bronze Bushing
4.	1	G-821-13 W	Lug
	2	CH-17-111	Shim, 16 Ga.
	1	CG-17-111	Shim, 1/4" x 2" Bar
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"

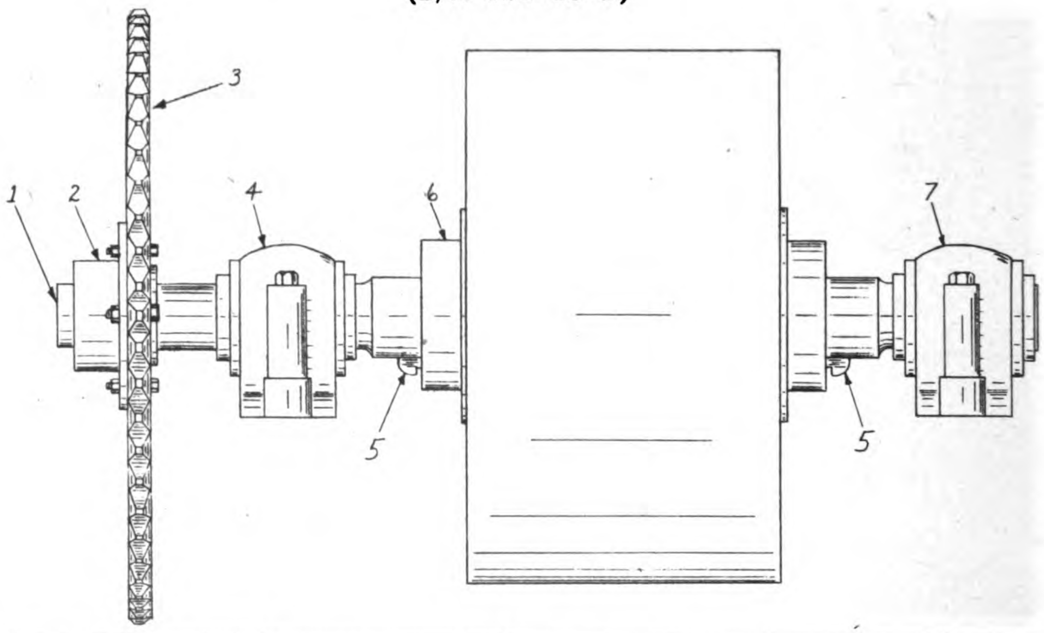
Main Drive Idler (Continued)

(B/M 821-13-B)



CRUSHER SMOOTH ROLL

(B/M 821-10-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-10	Shaft, 3-11/16" x 3' 7-5/8", S.A.E. 1045
2,	1	2830-A	Sprocket, Hub
	1	0-17-41	Key, 3/4" x 3/4" x 4-1/2"
	1		Set Screw, 3/4" x 1-1/4"
	1		Set Screw, 3/4" x 1-1/2"
3.	1	Q-19-746	Sprocket, 68-Tooth
	6		Hex Head Cap Screw, Nut, & Lock Washer, 5/8" x 2-1/2" (S.A.E. Thread)
4.	1	BR-AH-B4	Ball Bearing, Ahlberg "CJB" Type 97215-2
	1		Street Elbow, 1/4"
	1	EE-17-43	Pipe, 1/4" x 1' 4-1/8"
	2		Elbow, 1/4"
	2	E-17-43	Pipe, 1/4" x 1-1/2"
	1		Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male

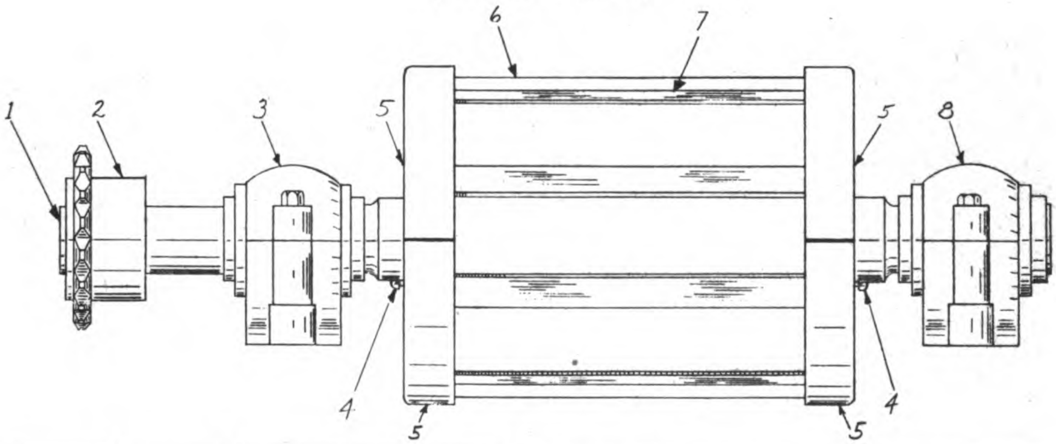
Crusher Smooth Roll (Continued)

(B/M 821-10-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 7/8" x 4-1/4"
	4	T-821-12	Stop Shim, 12 Ga.
	8	U-821-12	Stop Shim, 16 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
5.	2	AA-17-38	Taper Gib Key
6.	1	3760	Smooth Disintegrator Roll
	2		Set Screw, 3/4" x 2"
7.	1	BR-AH-B5	Ball Bearing, Ahlberg "CJB" Type 97215-3
	1		Street Elbow, 1/4"
	1		1/4" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 7/8" x 4-1/4"

CRUSHER CUTTER ROLL

(B/M 821-10-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-10	Shaft, 3-11/16" x 3' 7-5/8", S.A.E. 1045
2.	1	D-19-841	Sprocket, 19-Tooth
	1	Z-17-41	Key, 3/4" x 3/4" x 3-7/16"
	1		Set Screw, 3/4" x 1"
	1		Set Screw, 3/4" x 1-1/2"
3.	1	BR-AH-B4	Ball Bearing Ahlberg "CJB" Type 97215-2
	1	E-17-43	Pipe, 1/4" x 1-1/2"
	1		Elbow, 1/4" x 90°
	1		1/4" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 7/8" x 13"
	8	P-821-12	Stop Shim, 3/8" x 4" Bar
	4	Q-821-12	Stop Shim, 12 Ga.
	12	S-821-12	Stop Shim, 16 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 2-1/4"

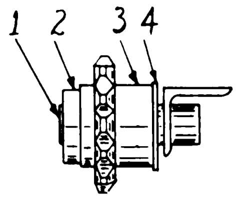
Crusher Cutter Roll (Continued)

(B/M 821-10-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
4.	2	BB-17-38	Taper Gib Key
5.	8	3761	Retainer Ring
	16		Machine Bolt, 5/8" x 3-1/4"
	16		Anco Lock Nut, 5/8"
	16		Lock Washer, 5/8"
6.	1	3759	Disintegrator Cutter Roll
	2		Set Screw, 5/8" x 7/8"
7.	8	B-821-10	Cutter Blade, High Carbon Heat Treated Steel
8.	1	BR-AH-B5	Ball Bearing, Ahlberg "CJB" Type 97215-3
	1		Street Elbow, 1/4" x 90°
	1		1/4" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 7/8" x 13"

CUTTER ROLL IDLER

(B/M 821-81-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-81 W	Idler Shaft
	1		1/8" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 1/2" x 1-1/4"
2.	1	CC-3-935	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
3.	1	G-19-357	Sprocket, 11-Tooth
	2	K-8-55	Bronze Bushing
4.	1	DG-17-9	Washer

SMOOTH ROLL BEARING SUPPORT

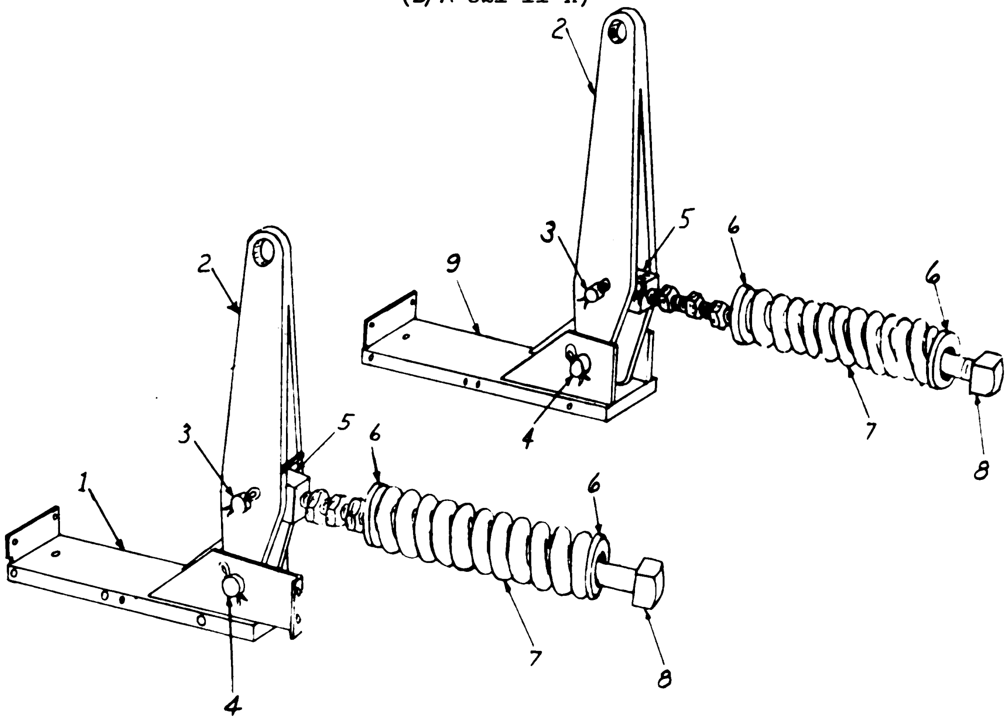
(B/M 821-11-A)

See Illustration on following page.

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	DD-821-12-W	Bearing Support
	1	D-17-43	Pipe, 1/4" x 1-1/4"
	1		Elbow, 1/4"
	1	BZ-17-43	Pipe, 1/4" x 1' 2"
	1		Pipe Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
	1		Pipe Plug, 1/4"
	1		Street Elbow, 1/4"

Smooth Roll Bearing Support (Continued)

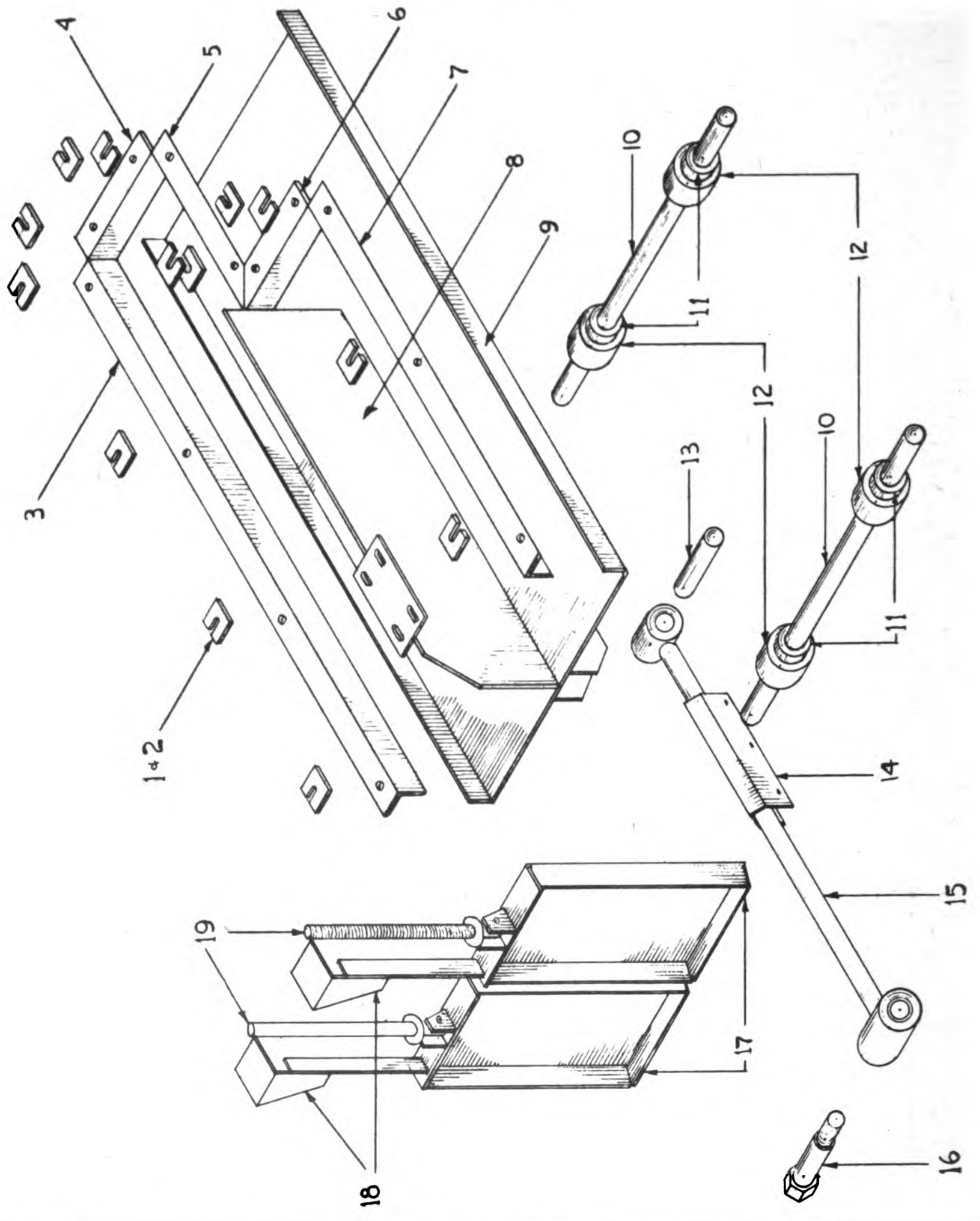
(B/M 821-11-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	2	M-821-12	Shim, 3/8" x 4" Bar
	3	N-821-12	Shim, 12 Ga.
	4	O-821-12	Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-1/2"
2.	2	W-821-12-W	Rocker Arm
	2	K-3-935	Collar
	2		Set Screw, 1/2" x 3/4"
3.	2	BB-821-12	Shaft, 1-7/16" x 5-5/8", S.A.E. 1045
	4		Cotter, 1/2" x 2-1/2"
4.	2	AA-821-12	Shaft, 1-7/16" x 7", S.A.E. 1045
	4		Cotter, 1/2" x 2-1/2"
5.	2	Z-821-12	Bar
	4	MT-17-9	Washer
6.	4	K-821-12-W	Spring Seat
7.	2	A-46-239	Spring
8.	2	G-821-12-W	Take-Up Bolt
	6		Half Nut, 1-1/2"
9.	1	CC-821-12-W	Bearing Support
	1	D-17-43	Pipe, 1/4" x 1-1/4"
	1		Pipe Plug, 1/4"
	1		Pipe Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
	2	M-821-12	Shim, 3/8" x 4" Bar
	3	N-821-12	Shim, 12 Ga.
	4	O-821-12	Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-1/2"
	6		Machine Bolt, Nut, & Lock Washer, 3/4" x 8"

RECIPROCATING FEEDER

(B/M 821-198-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	26	CG-17-111	Shim, 1/4"
2.	39	CH-17-111	Shim, 16 Ga.
3.	1	DD-821-163	Angle
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"
4.	1	EE-821-163	Angle
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"
5.	1	A (L) 821-164	Angle
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"

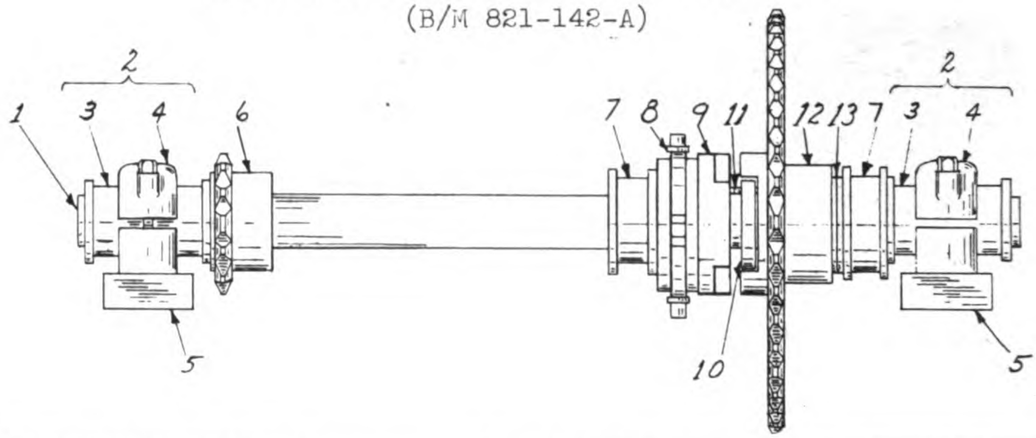
Reciprocating Feeder (Continued)

(B/M 821-198-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	1	B (L) 821-164	Angle
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"
7.	1	C-821-164	Angle
	3		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-3/4"
8.	1	D-821-165-W	Divider Plate
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 3/8" x 1-1/4"
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
9.	1	A-821-200 W	Feeder Pan
	2		Set Screw, 3/8" x 1"
10.	2	D-821-198	Shaft, 1-7/16" x 2' 0-1/4", S.A.E. 4140
	2		1/8" Hydraulic Alemite, Male
	2		1/8" x 30° Hydraulic Alemite, Male
11.	8	CC-3-935	Collar
	16		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
12.	4	E-3-1097	Roller
	4	H-8-32	Bronze Bushing
13.	1	D-830-57	Pin
	1		1/4" Hydraulic Alemite, Male
14.	1	H-821-198-W	Guard
	3		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/2"
15.	1	J-821-200-W	Connecting Rod
	1		1/4" Hydraulic Alemite, Male
	2	D-8-35	Bronze Bushing
16.	1	H-834-69-W	Special Bolt
	1	CF-17-9	Washer
	1		Hex Half Nut, 1-1/4"
17.	2	V-821-200-W	Gate
18.	2	G-821-198-W	Scale Bracket
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	2	A-821-198	Scale
	4		Round Head Stove Bolt, Nut, & Lock Washer, & Cut Washer, 1/4" x 3/4"
19.	2	W-821-200-W	Take-Up Screw
	2		Machine Bolt, Two nuts, 3/8" x 2-1/2"
	4	K-17-24	Hex Nut, 1" Acme Thread

RECIPROCATING FEEDER COUNTER SHAFT

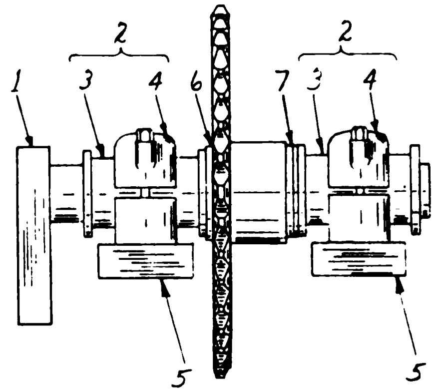
(B/M 821-142-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-142	Shaft, 1-11/16" x 2' 6-1/2", S.A.E. 1045
2.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
3.	2	3567	Bearing
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
4.	2	822 A	Bearing Cap
5.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	2	BQ-17-109	Shim, 1/4" x 3" Bar
	4		Machine Bolt, & Nut, 5/8" x 3-1/2"
	4		Bevel Washer, 5/8"
	8	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
6.	1	B-19-689	Sprocket, 13-Tooth
	1	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	1		Low Head Set Screw, 1/2" x 5/8"
	1		Low Head Set Screw, 1/2" x 7/8"
7.	2	183	Collar
	2		Low Head Set Screw, 1/2" x 5/8"
8.	1	2427	Shifter Yoke
	1		1/4" Hydraulic Alemite, Male
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/4"
9.	1	2864 A	Jaw Clutch
10.	1	G-3-938	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
11.	1	AB-17-107	Feather Key, 3/8" x 3/8" x 3-3/16"
12.	1	B-19-847 W	Sprocket, 41-Tooth
	2	U-8-55	Bronze Bushing
	1		1/4" Hydraulic Alemite, Male
	1	T-17-43	Pipe, 1/4" x 8-1/2"
	1		Elbow, 1/4" x 90°
	2	AG-17-9	Washer

RECIPROCATING FEEDER CRANK SHAFT

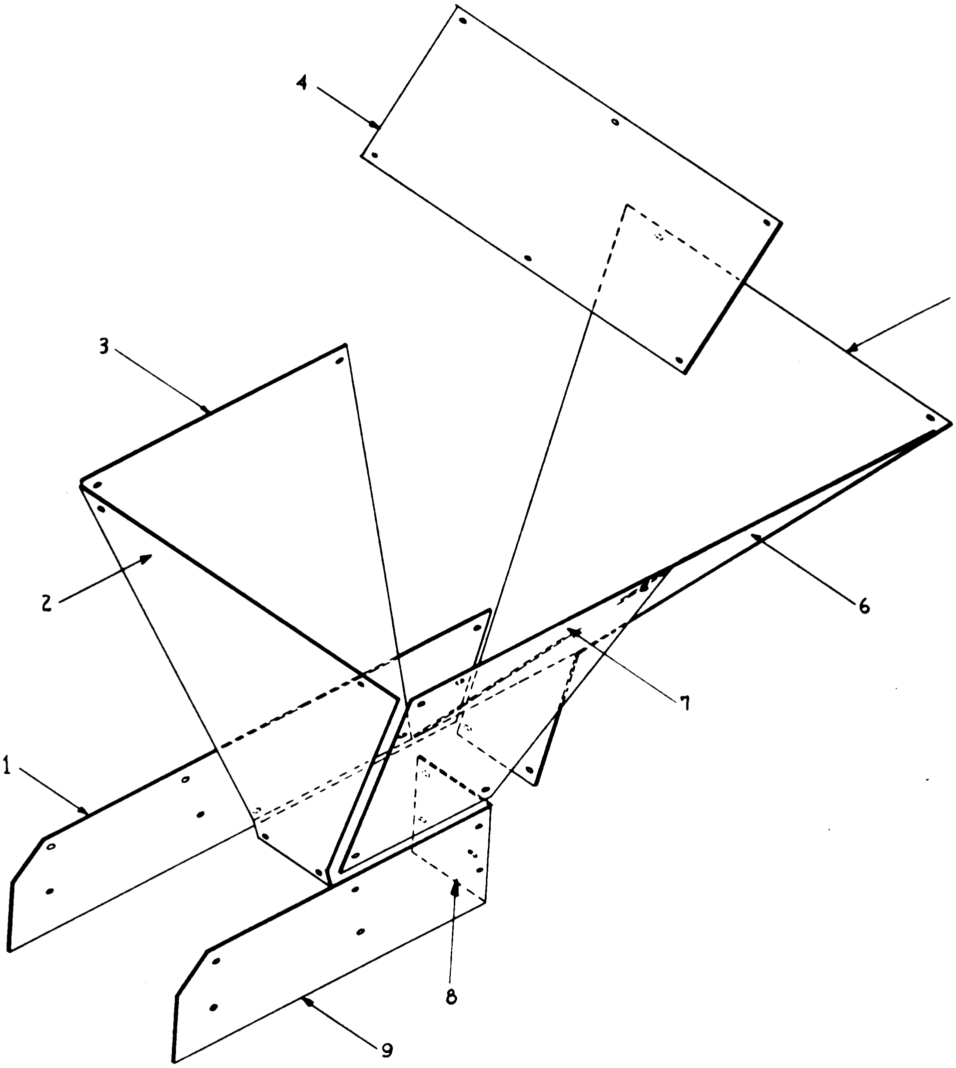
(B/M 821-147-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-821-147-W	Crank Shaft
	2		Set Screw, 3/8" x 3/4"
2.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
3.	2	3567	Bearing
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
4.	2	822-A	Bearing Cap
5.	2	821	Bearing Base
	2	BQ-17-109	Shim, 1/4" x 3" Bar
	2	BP-17-109	Shim, 12 Ga.
	4	BO-17-109	Shim, 16 Ga.
	2	BS-17-109	Shim, 20 Ga.
	4		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 3"
	8	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
6.	1	19-474-MM	Sprocket, 36-Tooth
	1	E-17-32	Key, 3/8" x 3/8" x 2-1/4"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
7.	2	AG-17-9	Washer

Always give Serial Number of Machine, Parts Number and Description.

AGGREGATE HOPPER LINERS
(B/M 821-165-A)

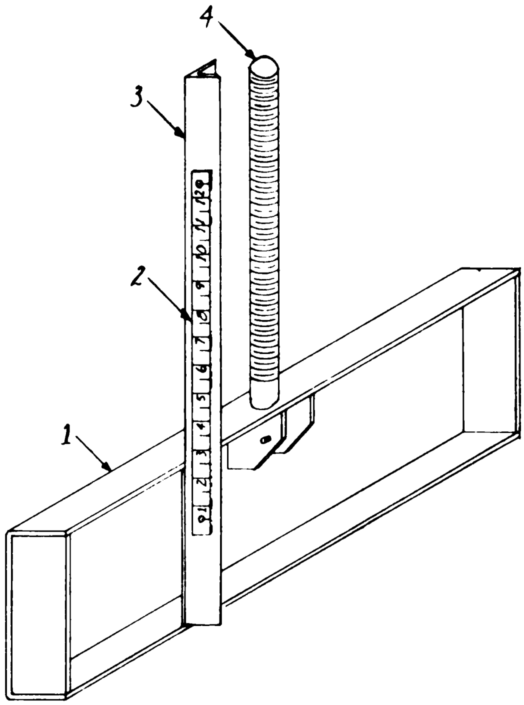


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	F-821-164	Liner
	6		Flat Head Cap Screw Nut, & Lock Washer, 3/8" x 3/4"
2.	1	E-821-164	Liner
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
3.	1	K-821-164	Liner
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
4.	1	G-821-164	Liner
	6		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
5.	1	D-821-164	Liner
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"

Aggregate Hopper Liners (Continued)
(B/M 821-165-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	1	J-821-164	Liner
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
7.	1	H-821-164	Liner
	4		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 3/4"
8.	1	N-821-164	Liner
	2		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
9.	1	M-821-164	Liner
	6		Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"

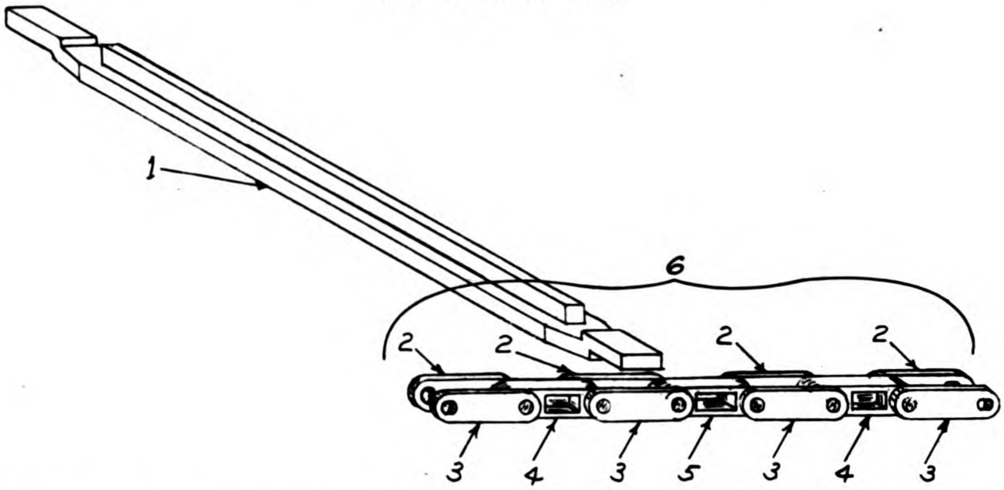
SOIL HOPPER FEEDING GATE
(B/M 821-125-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	J-821-122-W	Gate
2.	1	C-46-151	Scale
	2		Machine Bolt, Nut, & Lock Washer, 1/4" x 3/4"
3.	1	P-821-122	Scale Support
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
4.	1	Q-821-122	Adjusting Bolt with Acme Thread (4 Threads per inch)
	2	K-17-24	Hex Nut, 1", Acme Thread
	1		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"

SOIL HOPPER FLIGHTS AND CHAIN

(B/M 821-124-A)

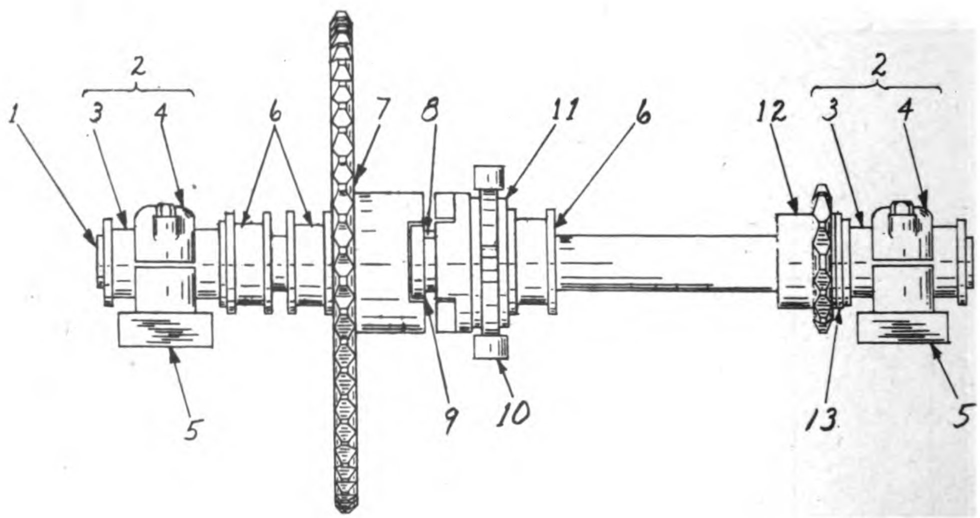


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	10	B-821-124-W	Flight
2.	40	A-6-18	Side Bar (Round Holes)
3.	40	B-6-18	Side Bar (Flat Holes)
4.	20	E-6-22	Block Link (Closed Slot)
5.	20	D-6-22	Block Link (Open Slot)
	78	B-6-19	Rivet Pins
	2	A-6-19	Coupler Pins
	2		Cotters, 3/16" x 3/4"
6.	2	E-6-26R	Riveted Strands BG-CN188 Block Chain - 40 links

SOIL FEEDER COUNTER SHAFT

(B/M 821-151-A)

See Parts List on following page.



Soil Feeder Counter Shaft (Continued)

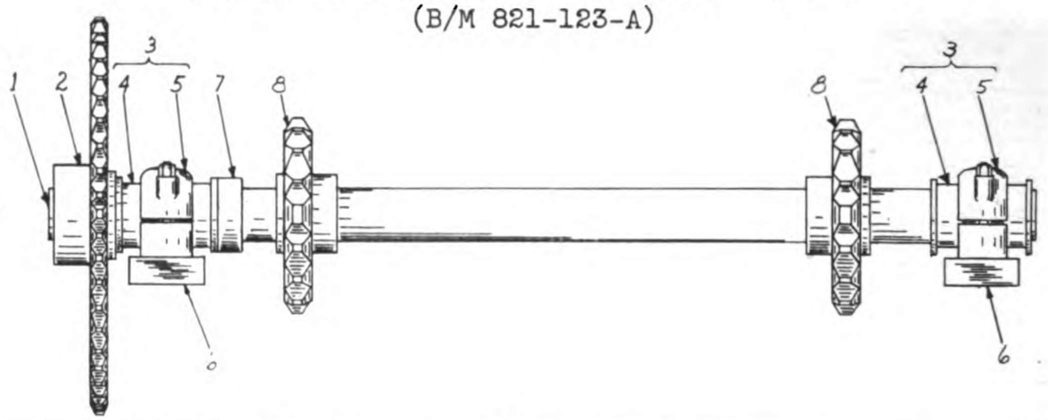
(B/M 821-151-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-151	Shaft, 1-11/16" x 2' 4-1/2", S.A.E. 1045
2.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
3.	2	3567	Bearing
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
4.	2	822-A	Bearing Cap
5.	2	821	Bearing Base
	4		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 2-3/4"
	2	BQ-17-109	Shim, 1/4" x 3" Bar
	2	BP-17-109	Shim, 12 Ga.
	4	BO-17-109	Shim, 16 Ga.
	8	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
6.	3	183	Collar
	3		Low Head Set Screw, 1/2" x 5/8"
7.	1	B-19-851 W	Sprocket, 49-Tooth
	1		1/8" Hydraulic Alemite, Male
	2	U-8-55	Bronze Bushing
8.	1	DD-17-107	Feather Key, 3/8" x 3/8" x 3-3/4"
9.	1	G-3-938	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
10.	1	2427 C	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
	1		1/8" Hydraulic Alemite, Male
11.	1	2864-E	Jaw Clutch
12.	1	B-19-689	Sprocket, 13-Tooth
	1	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	1		Low Head Set Screw, 1/2" x 5/8"
	1		Low Head Set Screw, 1/2" x 7/8"
13.	1	AG-17-9	Washer, 12 Ga.
13.	1	BD-17-9	Washer, 14 Ga.

Always give Serial Number of Machine, Parts Number and Description.

SOIL FEEDER HEAD SHAFT

(B/M 821-123-A)

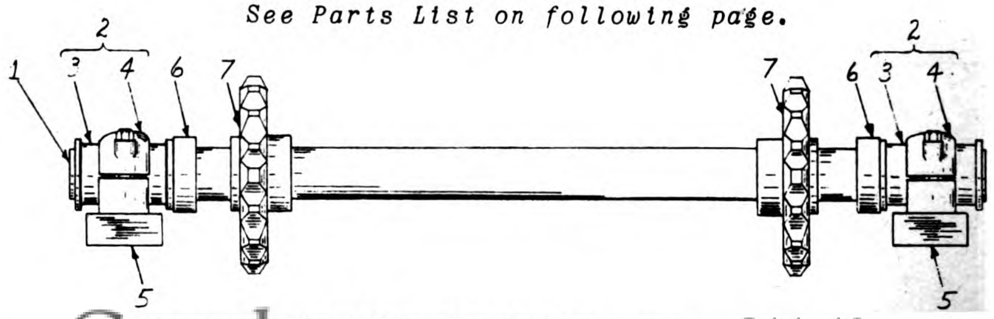


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-123	Shaft, 1-15/16" x 3' 2-3/4", S.A.E. 1045
2.	1	19-473-M	Sprocket, 48-Tooth
	1	A-17-33	Key, 1/2" x 1/2" x 2-7/16"
	1		Set Screw, 5/8" x 1"
	1		Set Screw, 5/8" x 1-1/4"
3.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
4.	2	2419 A	Bearing
	1		1/8" Hydraulic Alemite, Male, (For Sprocket End Bearing)
	1		1/8" x 90° Hydraulic Alemite, Male
5.	2	822 B	Bearing Cap
6.	2	821	Bearing Base
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/4"
	2	BO-17-109	Shim, 16 Ga.
	2	AF-17-28	Stop Shim, 1/2" x 2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
7.	1	0-3-941	Collar
	2		Set Screw, 1/2" x 3/4"
8.	2	3383 A	Sprocket, 8-Tooth
	2	T-17-33	Key, 1/2" x 1/2" x 2-1/2"
	2		Allen Cup Point Safety Set Screw, 5/8" x 5/8"
	2		Allen Cup Point Safety Set Screw, 5/8" x 3/4"

SOIL FEEDER FOOT SHAFT

(B/M 821-123-B)

See Parts List on following page.



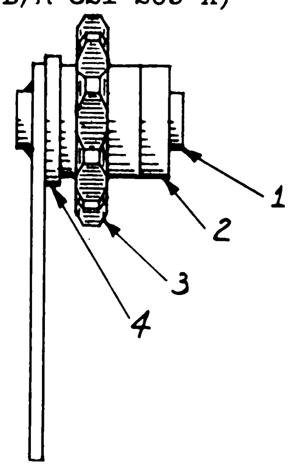
Soil Feeder Foot Shaft (Continued)

(B/M 821-123-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-821-123	Shaft, 1-15/16" x 3' 0-1/4", S.A.E. 1045
2.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 5-3/4"
3.	2	2419 A	Bearing
	2		1/8" Hydraulic Alemite, Male
4.	2	822 B	Bearing Cap
5.	2	821	Bearing Base
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3-1/4"
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	6	BQ-17-109	Shim, 1/4" x 3" Bar
	4	C-821-123	Stop Shim, 1/4" x 2" Bar
	2	D-821-123	Stop Shim, 12 Ga.
	4	E-821-123	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 1-1/2"
6.	2	0-3-941	Collar
	4		Set Screw, 1/2" x 3/4"
7.	2	3383 A	Sprocket, 8-Tooth
	2	T-17-33	Key, 1/2" x 1/2" x 2-1/2"
	2		Allen Cup Point Safety Set Screw, 5/8" x 5/8"
	2		Allen Cup Point Safety Set Screw, 5/8" x 3/4"

S O I L   F E E D E R   I D L E R

(B/M 821-205-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-821-205-W	Idler Shaft
	1		1/8" Hydraulic Alemite, Male
2.	1	T-3-951	Collar
	2		Set Screw, 1/4" x 5/8"
3.	1	E-19-200	Sprocket, 10-Tooth
	1	C-46-149	Bronze Bushing
4.	1		Cut Washer, 1"

SOIL CONVEYOR BELT

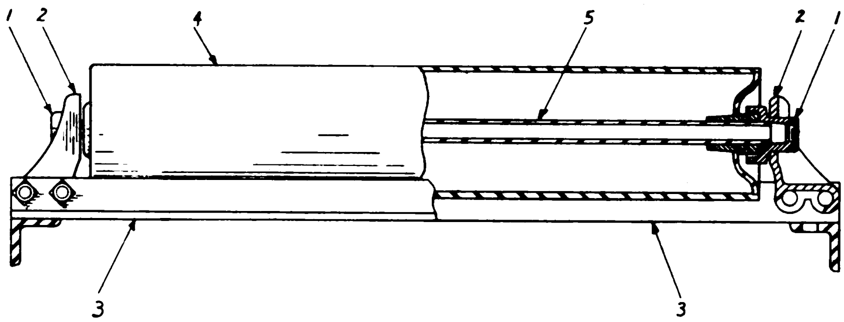
(B/M 821-127-B)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1		Belt, 4 Ply x 16" x 20' 8"
	2		#35 Alligator Lacing, 16"
	2		#35 Alligator Rocker Pin, 16"

16" FLAT CARRIER

(B/M 14-54-B)

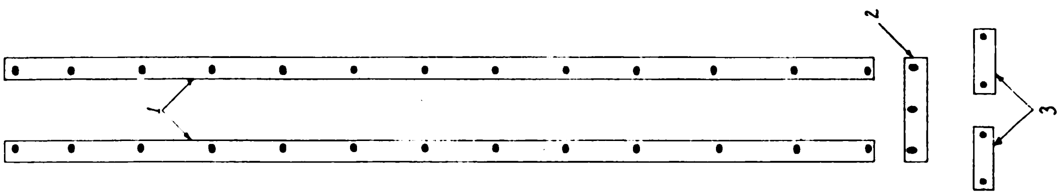
NOTE: Two Carriers Required on Machine



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	760	Pipe Cap
	2		1/4" Hydraulic Alemite, Male
	4		Street Elbow, 1/4" x 90°
2.	2	747	End Stand
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 4-3/4"
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
3.	2	C-14-54	Side Angle
4.	1	D-14-172-M	Roll
5.	1	G-14-57	Roll Shaft

CONVEYOR FLASHING AND SCRAPER

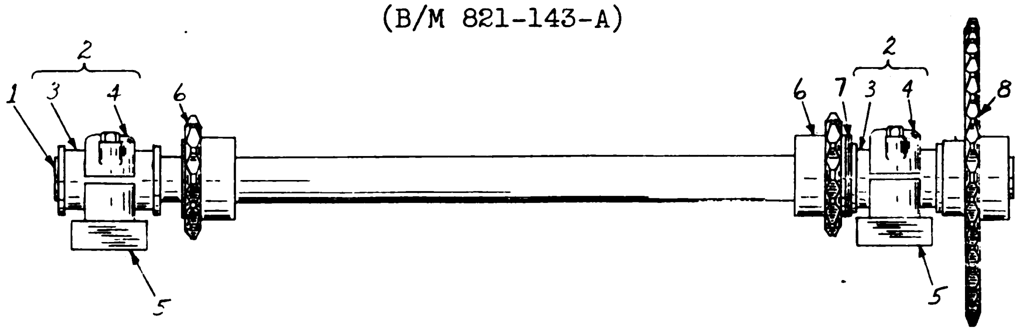
(B/M 821-126-B) (B/M 821-128-A) (B/M 821-128-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	E-821-129	Rubber Flashing
	26		Oval Head Elevator Bolt, Nut, & Lock Washer, 5/16" x 1"
2.	1	G-821-129	Rubber Flashing
	3		Oval Head Elevator Bolt, Nut, & Lock Washer, 5/16" x 1"
3.	2	K-821-127	Scraper, High Carbon Steel
	4		Machine Bolt, Nut, & Lock Washer, 3/8" x 3/4"

CONVEYOR COUNTER SHAFT

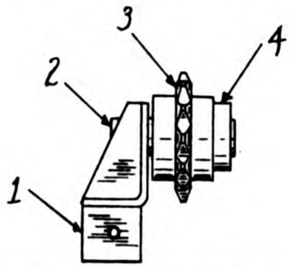
(B/M 821-143-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-143	Shaft, 1-11/16" x 3' 1-7/8",S.A.E. 1045
2.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
3.	2	3567	Bearing
	2	T-17-43	Pipe, 1/4" x 8-1/2"
	2		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
4.	2	822 A	Bearing Cap
5.	2	821	Bearing Base
	2	BP-17-109	Shim, 12 Ga.
	4	BO-17-109	Shim, 16 Ga.
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 3-1/4"
	2		Bevel Washer, 5/8"
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 8"
	8	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
6.	2	B-19-689	Sprocket, 13-Tooth
	2	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	2		Low Head Set Screw, 1/2" x 5/8"
	2		Low Head Set Screw, 1/2" x 7/8"
7.	2	AG-17-9	Washer
8.	1	19-474-FF	Sprocket, 36-Tooth
	1	H-17-32	Key, 3/8" x 3/8" x 2-9/16"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"

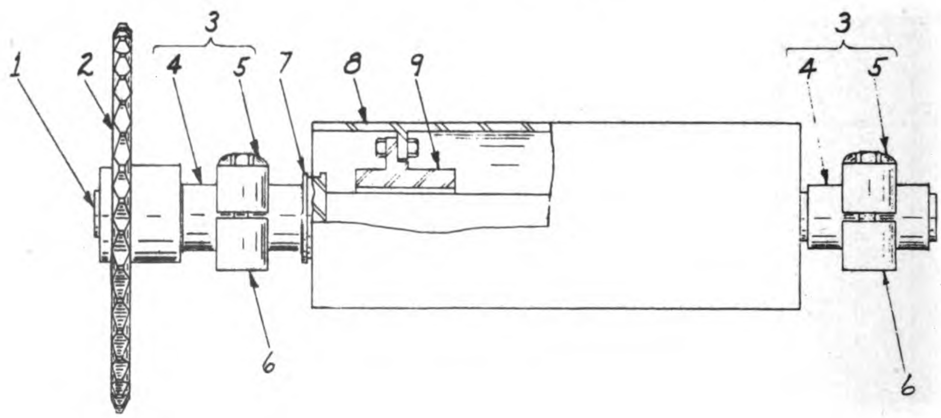
Always give Serial Number of Machine, Parts Number and Description.

CONVEYOR COUNTER SHAFT IDLER
(B/M 821-175-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	E-821-175	Bracket
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	1		Bevel Washer, 1/2"
2.	1	A-821-175-W	Idler Shaft
	2		Machine Bolt, Nut, Lock Washer, & Cut Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
3.	1	B-19-804	Sprocket, 13-Tooth
	2	B-8-25	Bronze Bushing
4.	1	B-3-932	Collar
	2		Set Screw, 3/8" x 3/4"

SOIL CONVEYOR HEAD SHAFT
(B/M 821-126-A)

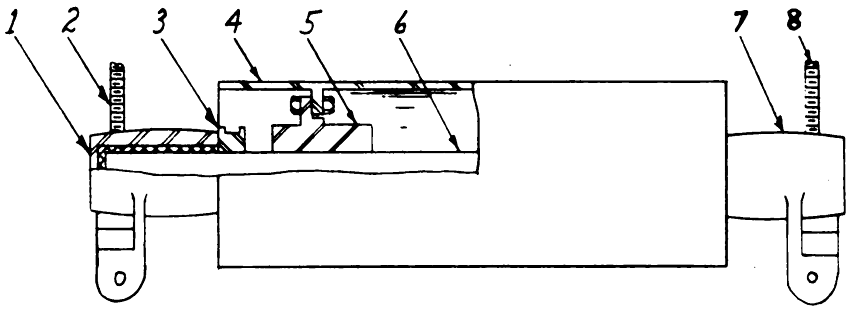


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-126	Shaft, 1-7/16" x 2' 3-3/8", S.A.E. 1045
2.	1	19-474-F	Sprocket, 36-Tooth
	1	H-17-32	Key, 3/8" x 3/8" x 2-9/16"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
3.	2	13-228-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 4-1/4"

Soil Conveyor Head Shaft (Continued)
(B/M 821-126-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
4.	2	2726	Bearing
	2	A-13-45	Pipe, 1/4" x 1"
	2		1/8" x 30° Hydraulic Alemite, Male
5.	2	1307	Bearing Cap
6.	2	1306	Bearing Base
	4	V-17-109	Shim, 16 Ga.
	2	AF-17-28	Stop Shim, 1/2" x 2" Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
7.	1		Set Collar, 1-7/16" Standard
	1		Set Screw, 3/8" x 3/4"
8.	1	E-46-230	Pulley
9.	2	A-46-233	Pulley Hub
	2		Set Screw, 3/8" x 1"
	2		Set Screw, 3/8" x 1-1/4"
	2	0-17-32	Key, 3/8" x 3/8" x 3-1/4"

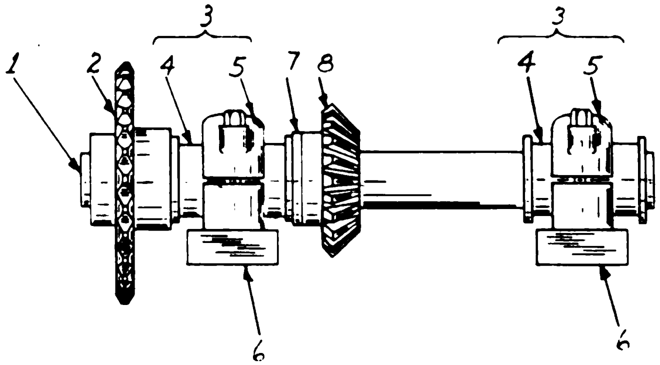
SOIL CONVEYOR FOOT SHAFT
(B/M 821-126-B) - (B/M 821-127-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	2274 A	Take-Up Bearing
	1		1/4" Hydraulic Alemite, Male
2.	1	F(L) 821-127 W	Take-Up Screw (Acme 1-3/16" - 4)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2	BU-17-24	Hex Nut, 1-1/4" - 4 Acme Thread
3.	2		Set Collar, 1-7/16" Standard
	2		Set Screw, 3/8" x 3/4"
4	1	E-46-230	Pulley
5.	2	A-46-233	Pulley Hub
	4		Set Screw, 3/8" x 1-1/4"
6	1	B-821-126	Shaft, 1-7/16" x 2' 0", S.A.E. 1045
7.	1	2273 A	Take-Up Bearing
	1		1/4" Hydraulic Alemite, Male
8.	1	F(R) 821-127 W	Take-Up Screw (Acme 1-3/16" - 4)
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2	BU-17-24	Hex Nut, 1-1/4" - 4 Acme

ELEVATOR BEVEL GEAR SHAFT

(B/M 821-149-A)

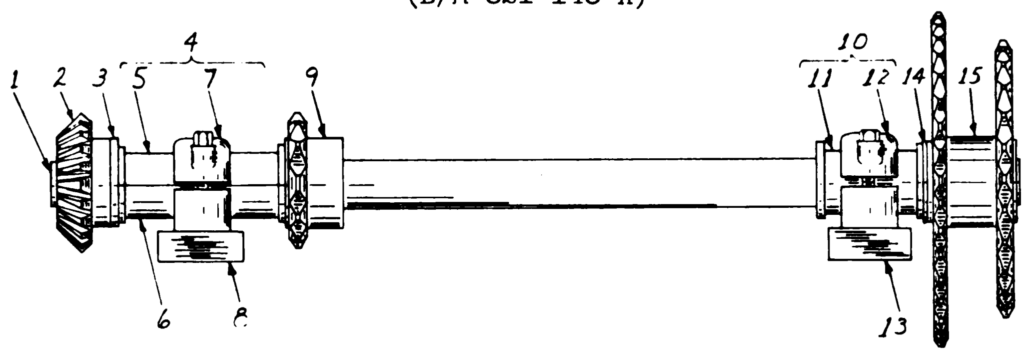


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-149	Shaft, 1-11/16" x 1' 6-5/8", S.A.E. 1045
2.	1	19-474-EE	Sprocket, 29-Tooth
	1	I-17-32	Key, 3/8" x 3/8" x 2-5/8"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
3.	2	13-210-H	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
4.	2	3567	Bearing
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
5.	2	822-A	Bearing Cap
6.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	2	BP-17-109	Shim, 12 Ga.
	2	BQ-17-109	Shim, 1/4" x 3" Bar
	2	BS-17-109	Shim, 20 Ga.
	4		Machine Bolt, Nut, Lock Washer, & Cut Washer, 5/8" x 3"
	4	SS-17-111	Stop Shim, 12 Ga.
	8	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
7.	1	J-17-164	Bronze Washer
8.	1	F-18-264	Bevel Gear, 20-Tooth
	1	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	1		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
	1		Allen Cup Point Safety Set Screw, 3/8" x 3/8"

Always give Serial Number of Machine, Parts Number and Description.

ELEVATOR BEVEL GEAR COUNTER SHAFT

(B/M 821-148-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-148	Shaft, 1-11/16" x 2' 10-3/4", S.A.E. 1045
2.	1	F-18-264	Bevel Gear, 20-Tooth
	1	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	1		Allen Cup Point Safety Set Screw, 3/8" x 3/8"
	1		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
3.	1	J-17-164	Bronze Washer
4.	1	13-210-J	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
5.	1	826 B	Upper Bearing Half
	1	G-17-43	Pipe, 1/4" x 2-1/4"
	1		Pipe Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male
6.	1	826 A	Lower Bearing Half
7.	1	822 A	Bearing Cap
8.	1	821	Bearing Base
	1	BQ-17-109	Shim, 1/4" x 3" Bar
	1	BP-17-109	Shim, 12 Ga.
	2	BO-17-109	Shim, 16 Ga.
	1	BS-17-109	Shim, 20 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 3"
	4	SS-17-111	Stop Shim, 12 Ga.
	4	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	2		Bevel Washer, 5/8"
9.	1	B-19-689	Sprocket, 13-Tooth
	1	XX-17-32	Key, 3/8" x 3/8" x 1-15/16"
	1		Low Head Cap Screw, 1/2" x 5/8"
	1		Low Head Set Screw, 1/2" x 7/8"
10.	1	13-210-H	Ball & Socket Bearing, (Complete)
	2		Machine Bolt, Nut, & Half Nut, 5/8" x 6"
11.	1	3567	Bearing
	1	G-17-43	Pipe, 1/4" x 2-1/4"
	1		Pipe Coupling, 1/4"
	1		1/4" Hydraulic Alemite, Male

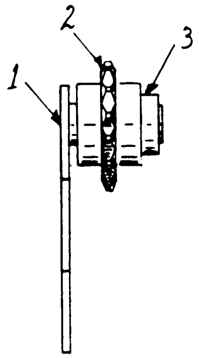
Elevator Bevel Gear Counter Shaft (Continued)

(B/M 821-148-A)

REF.NO.	NO.REQ.	PART.NO.	DESCRIPTION
12.	1	822 A	Bearing Cap
13.	1	821	Bearing Base
	1	BQ-17-109	Shim, 1/4" x 3" Bar
	1	BP-17-109	Shim, 12 Ga.
	2	BO-17-109	Shim, 16 Ga.
	1	BS-17-109	Shim, 20 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 3"
	2		Bevel Washer, 5/8"
	4	SS-17-111	Stop Shim, 12 Ga.
	4	TT-17-111	Stop Shim, 16 Ga.
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
14.	2	AG-17-9	Washer
15.	1	A-19-859 W	Double Sprocket, 30-Tooth, & 36-Tooth
	1	M-17-32	Key, 3/8" x 3/8" x 3"
	1		Set Screw, 1/2" x 3/4"
	1		Set Screw, 1/2" x 1-1/4"

ELEVATOR COUNTER SHAFT IDLER

(B/M 821-175-B)

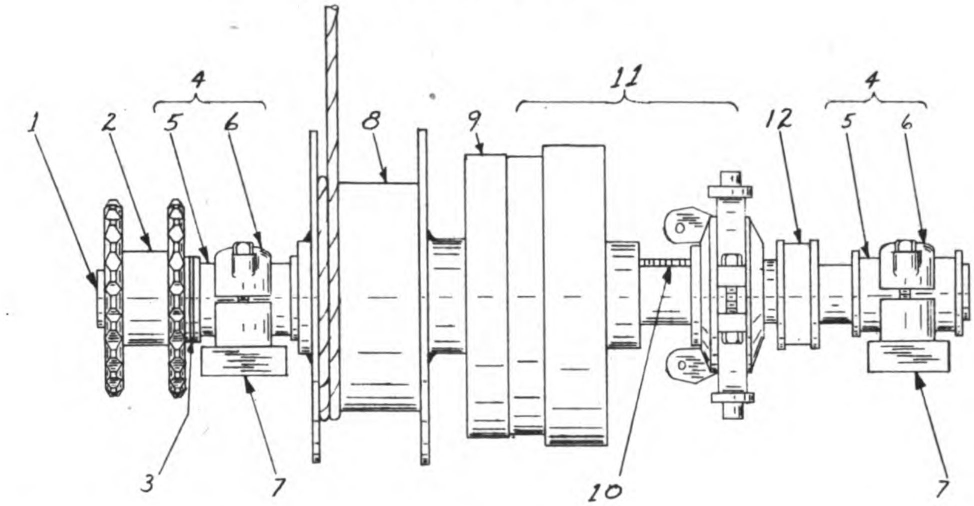


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	F-821-175 W	Idler Shaft
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
2.	1	B-19-804	Sprocket, 13-Tooth
	2	B-8-25	Bronze Bushing
3.	1	B-3-932	Collar
	2		Set Screw, 3/8" x 3/4"

Always give Serial Number of Machine, Parts Number and Description.

D R A G L I N E   S H A F T   "A"

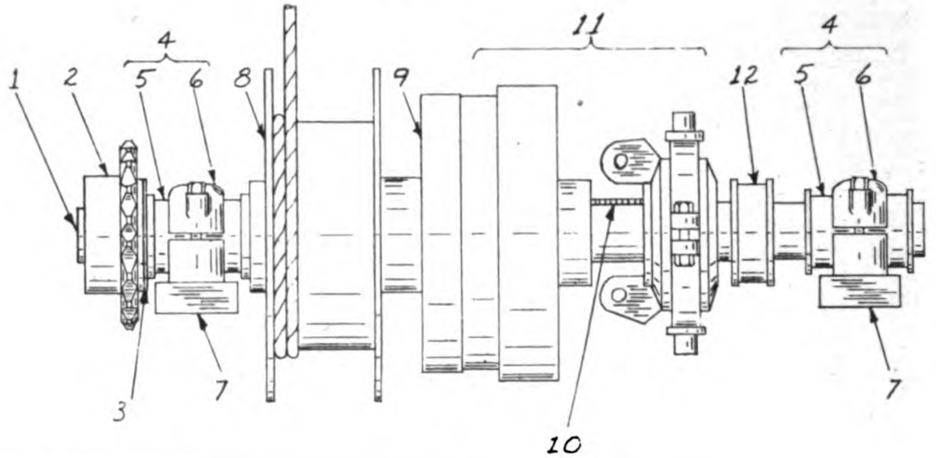
(B/M 821-150-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-150	Shaft 1-15/16" x 2' 7-3/4", S.A.E. 1045
2.	1	C-19-859 W	Double Sprocket, 20-Tooth
	1	WW-17-33	Key, 1/2" x 1/2" x 2-15/16"
	1		Set Screw, 5/8" x 3/4"
	1		Set Screw, 5/8" x 1-1/4"
3.	2	DD-17-9	Washer
4.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut 5/8" x 6"
5.	2	2419 A	Bearing
	2		1/8" x 90° Hydraulic Alemite, Male
6.	2	822 B	Bearing Cap
7.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	4	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3-1/2"
	4	QQ-17-111	Stop Shim, 1/4" x 2-1/2" Bar
	8	TT-17-111	Stop Shim, 16 Ga.
	4	SS-17-111	Stop Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
8.	1	E-3-1210 W	Cable Drum
	1		1/8" Hydraulic Alemite, Male
	2	G-8-75	Bronze Bushing
9.	1	3442	Brake Drum
	1	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"
10.	1	AM-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
11.	1	3-1007-A	Barber-Greene 8" Friction Clutch (See Page 530 For Details)
	1		1/8" x 90° Hydraulic Alemite, Male
12.	1	136	Collar
	1		Low Head Set Screw, 5/8" x 7/8"

DRAGLINE SHAFT "B"

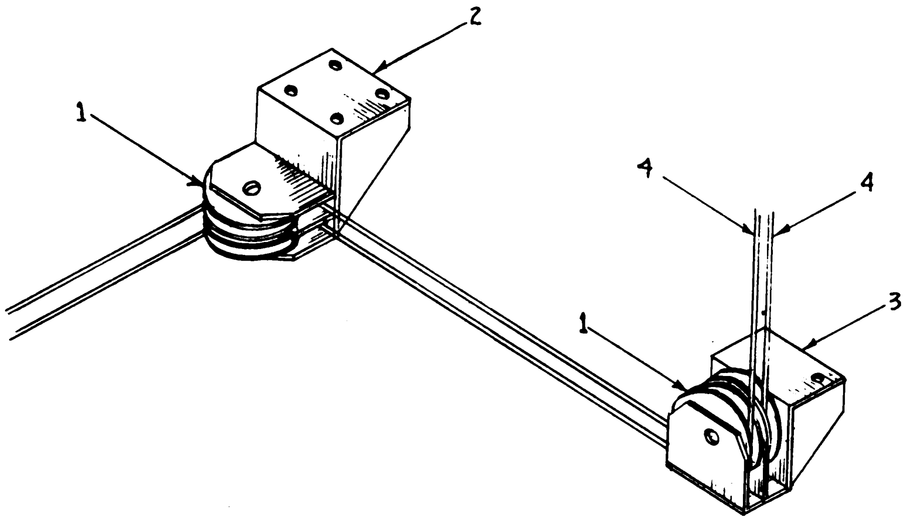
(B/M 821-150-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-821-150	Shaft, 1-15/16" x 2' 6-3/4", S.A.E. 1045
2.	1	19-473-F	Sprocket, 20-Tooth
	1	AR-17-33	Key, 1/2" x 1/2" x 1-15/16"
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
3.	2	DD-17-9	Washer
4.	2	13-213-C	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut 5/8" x 6"
5.	2	2419 A	Bearing
	2		1/8" x 90° Hydraulic Alemite, Male
6.	2	822 B	Bearing Cap
7.	2	821	Bearing Base
	4	BO-17-109	Shim, 16 Ga.
	4	BP-17-109	Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 3-1/2"
	4	QQ-17-111	Stop Shim, 1/4" x 2-1/2" Bar
	8	TT-17-111	Stop Shim, 16 Ga.
	4	SS-17-111	Stop Shim, 12 Ga.
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
8.	1	E-3-1210-W	Cable Drum
	1		1/8" Hydraulic Alemite, Male
	2	G-8-75	Bronze Bushing
9.	1	3442	Clutch Brake Drum
	1	ZZ-17-33	Key, 1/2" x 1/2" x 2-3/8"
10.	1	AM-17-106	Feather Key, 1/2" x 1/2" x 8-1/16"
11.	1	3-1007-A	Barber-Greene 8" Friction Clutch (See Page 530 For Details)
	1		1/8" x 90° Hydraulic Alemite, Male
12.	1	136	Collar
	1		Low Head Set Screw, 5/8" x 7/8"

DRAGLINE CABLE AND SHEAVES

(B/M 821-168-A)

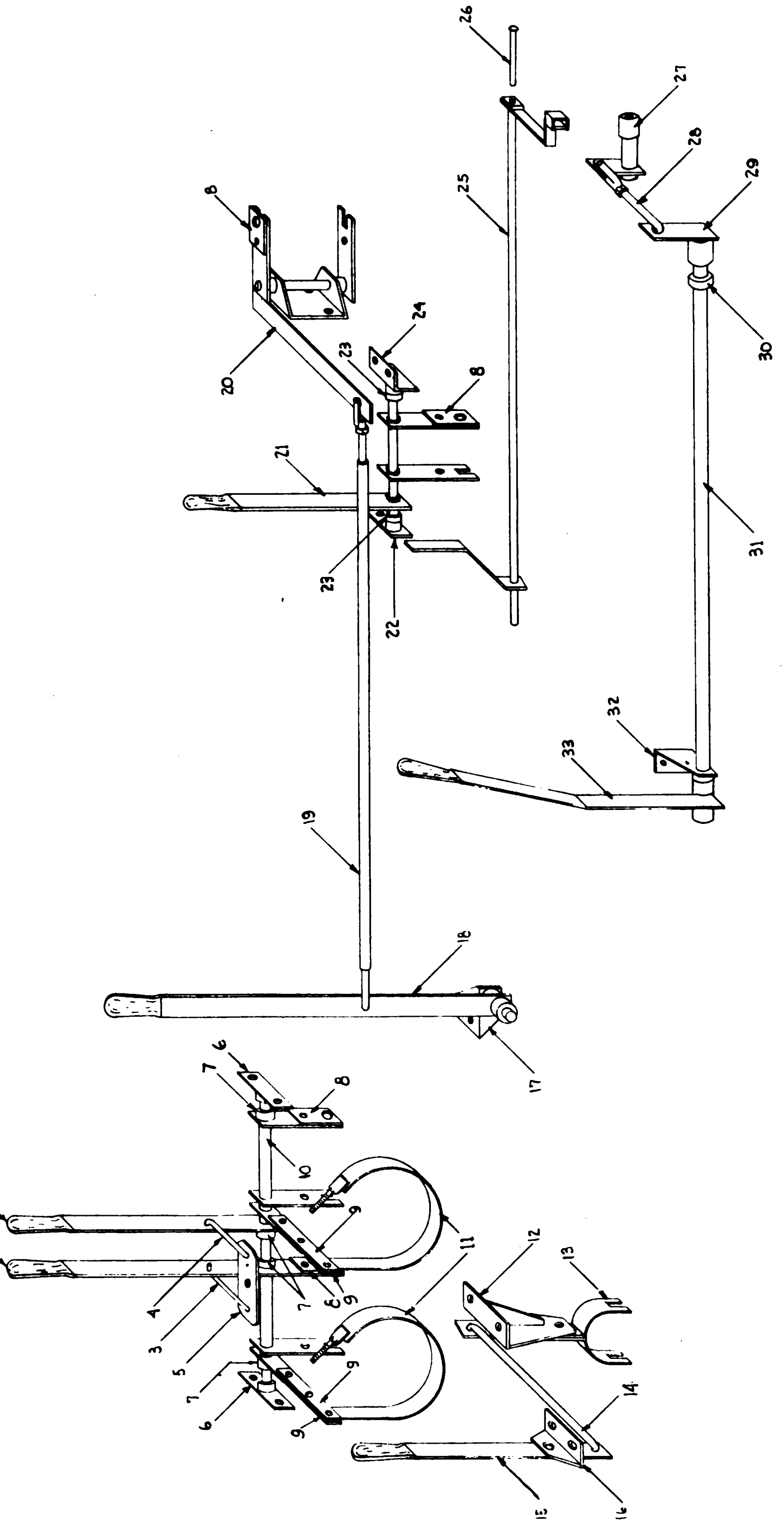


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	4	868-A	Sheave
	4	B-17-82	Tubing
	2	K-821-168	Hex Head Machine Bolt, 3/4" x 4-1/2"
	2		Hex Nut, 3/4"
	2		Lock Washer, 3/4"
	2		1/8" Hydraulic Alemite, Male
2.	1	D-821-168 W	Sheave Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	4		Bevel Washer, 1/2"
3.	1	J-821-168 W	Sheave Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2		Bevel Washer, 1/2"
4.	2		Cable, 5/16" x 75' 0"
	6		Cable Clamp, 5/16"

Always give Serial Number of Machine, Parts Number and Description.

CONTROLS

See Parts List on following page.



Controls (Continued)

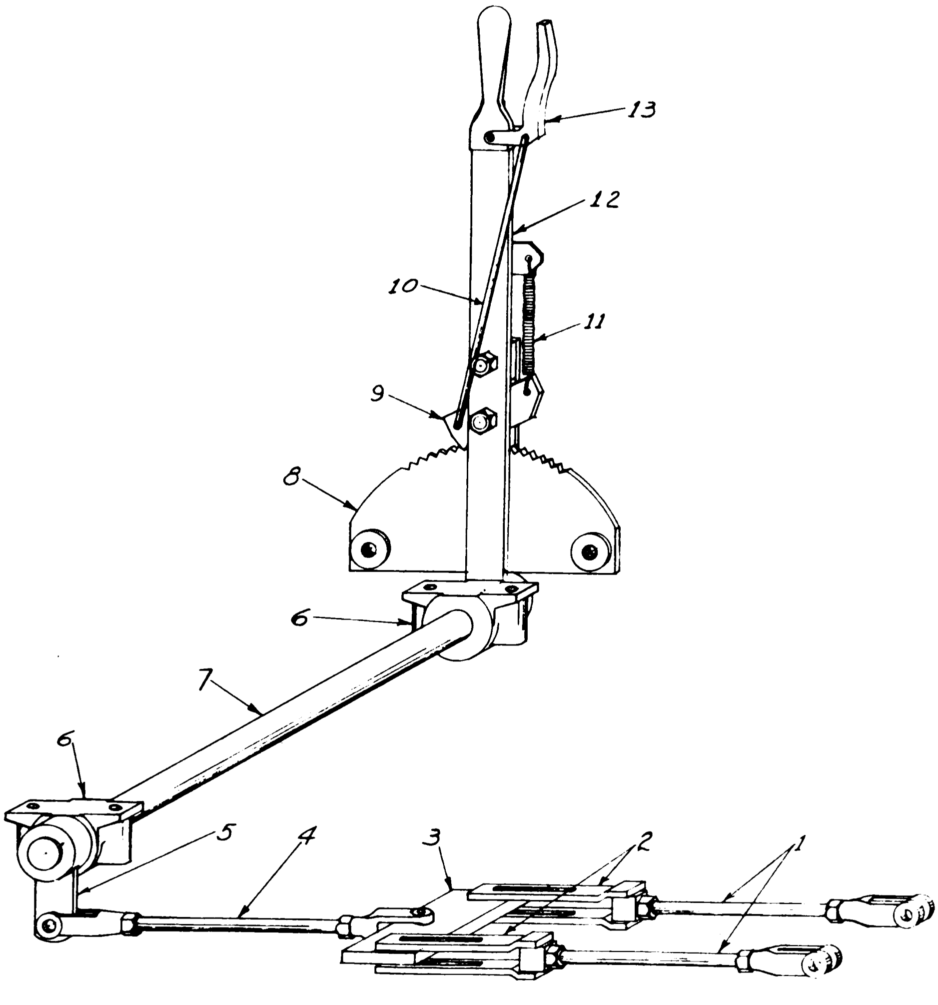
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	A-821-158-W	Lever (Drag Line)
2.	1	H-821-158-W	Lever (Drag Line)
3.	1	O (R) 821-158	Rod
	2		Cotter, 1/8" x 1"
	3		Cut Washer, 1/2"
4.	1	O (L) 821-158	Rod
	2		Cotter, 1/8" x 1"
	3		Cut Washer, 1/2"
5.	1	P-821-158	Lever Stop
	1	T-17-10	Pipe Spacer
	1		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/2"
6.	2	S-821-158-W	Bracket
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
7.	4	C-3-951	Collar
	4		Set Screw, 3/8" x 5/8"
8.	4	F-3-1028	Keeper Bar
	4		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 3/8" x 1-1/4"
9.	4	Q-821-158	Rocker Bar
	6	B-17-10	Pipe Spacer
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
10.	1	U-821-158	Shaft, 1" x 2' 5-3/8", S.A.E. #1020
11.	2	D-831-177-R	Brake Band
	4		Hex Nut, 1/2"
12.	1	B-821-172 W	Bracket
	1	BE-17-11	Pipe Spacer
	1		Machine Bolt, Nut, & Lock Washer, & 2 Cut Washers, 1/2" x 1-3/4"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
13.	1	E-821-172-W	Shifter Yoke
14.	1	A-821-172	Rod
	2		Cotter, 3/16" x 1-1/8"
15.	1	H-821-172	Lever (Soil Feeder)
	1	CC-17-10	Pipe Spacer
	1		Machine Bolt, Nut, & Lock Washer, & 2 Cut Washers, 1/2" x 1-1/2"
16.	1	J-821-172	Angle
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-3/4"
	2		Bevel Washer, 1/2"
17.	1	A-821-173-W	Bracket
	1	CO-17-9	Washer

Controls (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1		Cotter, 1/4" x 2"
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
18.	1	V-821-173-W	Lever (Main Jack Shaft Clutch)
19.	1	X-821-173-W	Lever Rod
	1		Cotter, 3/16" x 1-1/2"
	1	B-3-149	Yoke End
	1	C-17-23	Rivet
	1		Cotter, 1/8" x 1"
20.	1	E-821-173-W	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
21.	1	O-821-173-W	Lever & Shifter Yoke (Reciprocating Feeder)
22.	1	P-821-173-W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
23.	2	F-3-951	Collar
	2		Set Screw, 1/2" x 5/8"
24.	1	S-821-173-W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
25.	1	A-821-202-W	Lever Rod (Throttle Control)
26.	1	G-821-202	Rivet
	1		Cotter, 1/8" x 1"
	3		Cut Washer, 1/2"
27.	1	G-3-1154-W	Lever Arm
	2		Set Screw, 3/8" x 3/4"
	1		Style "A" Woodruff Key
	1		Set Screw, 3/8" x 5/8"
28.	1	Q-17-145	Rod
	1		Cotter, 3/16" x 1-1/2"
	1		Cut Washer, 3/4"
	1		Hex Nut, 3/4"
	1	B-3-149	Yoke End
	1	C-17-23	Rivet
	1		Cotter, 1/8" x 1"
29.	1	B-3-1218-W	Lever Arm
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	2		Set Screw, 3/8" x 1"
30.	1	T-3-932	Collar
	1		Set Screw, 3/8" x 3/4"
31.	1	E-821-170	Shaft, 1-3/16" x 6' 10-3/4", S.A.E. 1020
32.	1	A-821-170-W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, & Cut Washer, 1/2" x 1-1/4"
33.	1	E-3-1206-W	Lever (Master Clutch)
	1		Set Screw, 3/8" x 5/8"
	1		Set Screw, 3/8" x 1"
	1	FF-17-30	Key, 1/4" x 1/4" x 1-15/16"

PARKING BRAKE CONTROL

(B/M 821-183-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	C-17-144	Rod
	2	A-3-604	Yoke End
	2		Hex Nut, 1/2"
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"
2.	2	V-831-159-W	Yoke End
	2		Hex Nut, 1/2"
	2	Q-17-23	Rivet
	4		Cut Washer, 1/2"
	2		Cotter, 1/8" x 1"
3.	1	S-831-159	Equalizer
4.	1	AC-17-144	Rod
	2	A-3-604	Yoke End
	2		Hex Nut, 1/2"
	2	CP-17-23	Rivet
	2		Cotter, 1/8" x 1"

Parking Brake Control (Continued)

(B/M 821-183-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5.	1	G-3-1032 W	Lever Arm
	1	C-17-30	Key, 1/4" x 1/4" x 1-1/2"
	1		Set Screw, 3/8" x 3/8"
	1		Set Screw, 3/8" x 7/8"
6.	2	1383-E	Solid Bearing
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 3"
	2		1/8" x 90° Hydraulic Alemite, Male
	1	DO-17-139	Shim, 16 Ga.
7.	1	G-821-184	Shaft, 1-1/4" x 3' 6", S.A.E. #1020
8.	1	M-3-1197	Ratchet
	4	DM-17-9	Washer
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
9.	1	F-3-1197	Latch
	1	B-17-10	Pipe Spacer
	1	H-3-1197	Bar
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 2"
	1	J-3-1197	Bar
	1	K-3-1197	Bar
10.	1	G-3-1197	Rod
	2		Cotter, 3/32" x 1"
11.	1	D-46-154	Spring
12.	1	B-3-1197-W	Lever
	1	E-17-30	Key, 1/4" x 1/4" x 2"
	1		Set Screw, 3/8" x 1/2"
	1		Set Screw, 3/8" x 7/8"
13.	1	G-62-33	Grip Latch
	1	DC-17-23	Rivet
	1		Cotter, 3/32" x 1"

Always give Serial Number of Machine, Parts Number and Description.

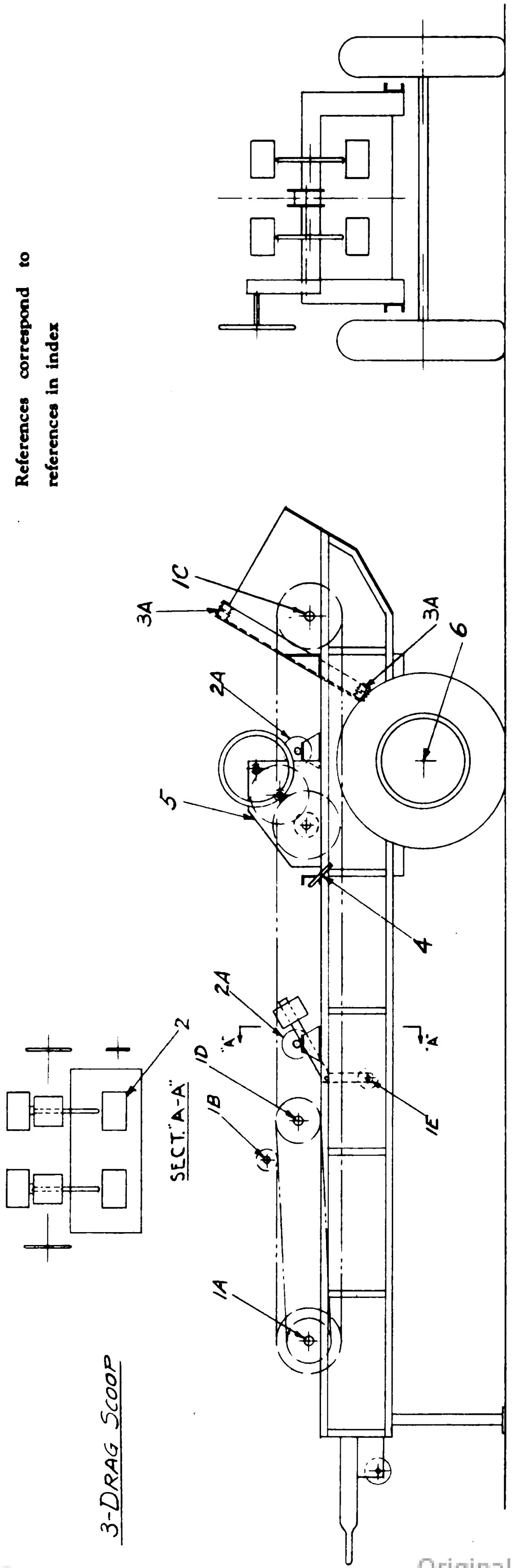
BARBER-GREENE

MODEL 831

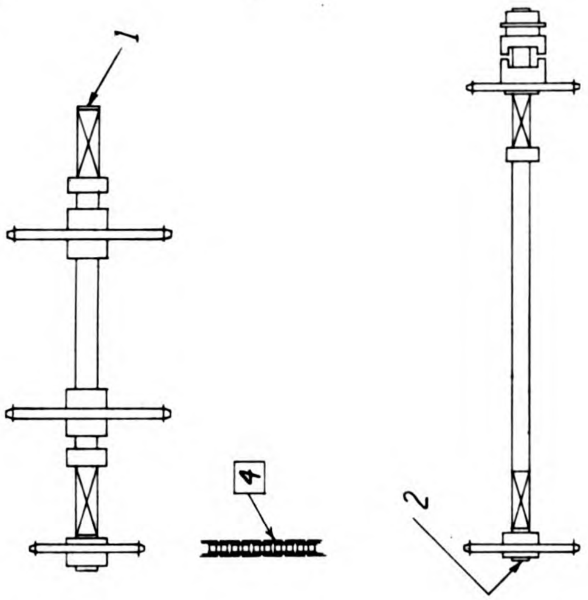
BUCKET ELEVATOR

Barber-Greene Model 831 Bucket Elevator

PARTS LIST
GRAPHIC INDEX
References correspond to references in index



CONTENTS

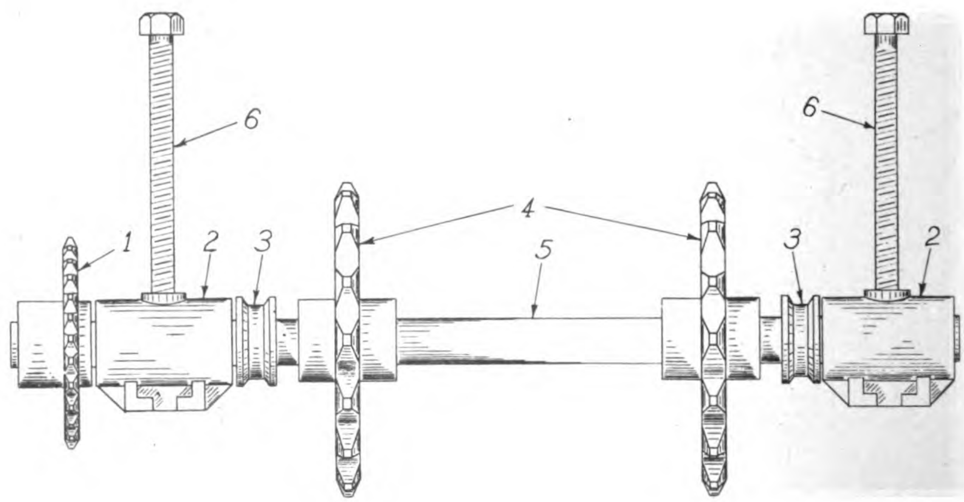


1. Elevator Head Shaft 2. Elevator Counter Shaft 3. Elevator Foot Shaft

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
4.	1	CW-6-58C	Strand of Diamond #434 1" P. - 122 Links
		A-6-58	Roller Link Diamond #434 1" P.
		B-6-58	Connecting Link Diamond #434 1" P.
		C-6-58	Offset Link Diamond #434 1" P.

ELEVATOR HEAD SHAFT
(B/M 831-226-A)

See Parts List on following page.



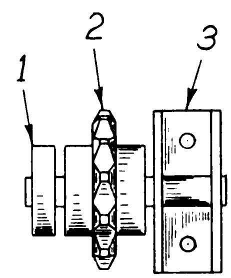
Elevator Head Shaft (Continued)

(B/M 831-226-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	19-473-P	Sprocket, 29-Tooth
	1	C-17-33	Key, 1/2" x 1/2" x 3-1/4"
	1		Set Screw, 5/8" x 7/8"
	1		Set Screw, 5/8" x 1-1/4"
2.	2	397 A	Take Up Bearing
	2		1/4" Hydraulic Alemite
3.	2	136	Collar
	2		Low Head Set Screw, 5/8" x 7/8"
4.	2	3613	Sprocket, 16-Tooth
	2	AN-17-33	Key, 1/2" x 1/2" x 4-1/4"
	2		Set Screw, 1/2" x 1"
	2		Set Screw, 1/2" x 1-1/8"
5.	1	A-831-226	Shaft, 1-5/16" x 3' 5-7/8" S.A.E. 4140
6.	2	FF-17-24	Take Up Bolt 1", 4 Acme Threads per inch
	2	K-17-24	Hex Nut 1", 4 Acme Threads per inch
	2	M-17-24	Square Nut 1", 4 Acme Threads per inch
	2		Lock Washer, 1"

HEAD SHAFT DRIVE IDLER

(B/M 831-225-B)

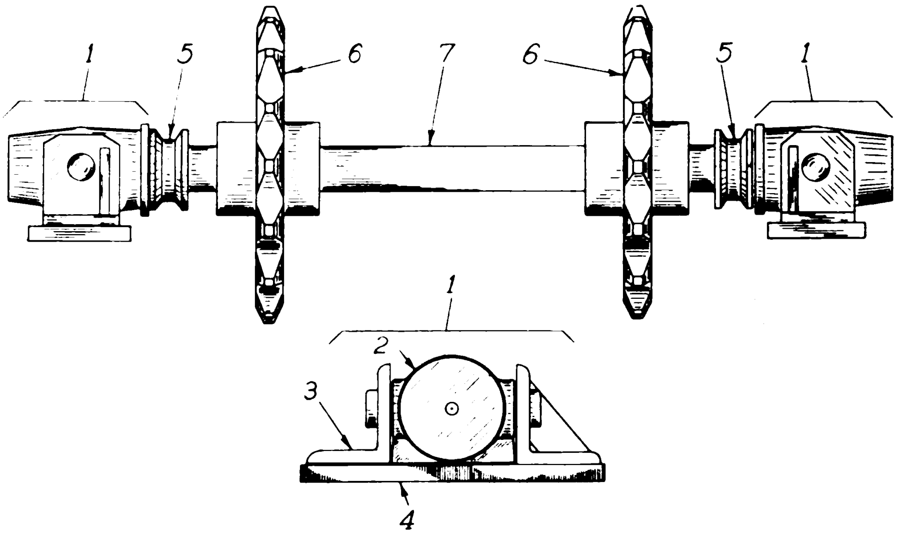


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-3-932	Collar
	2		Set Screw, 3/8" x 3/4"
2.	1	B-19-804	Sprocket, 13-Tooth
	2	B-8-25	Bronze Bushing
3.	1	J-831-225 W	Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male

Always give Serial Number of Machine, Parts Number and Description.

ELEVATOR FOOT SHAFT

(B/M 831-226-B)

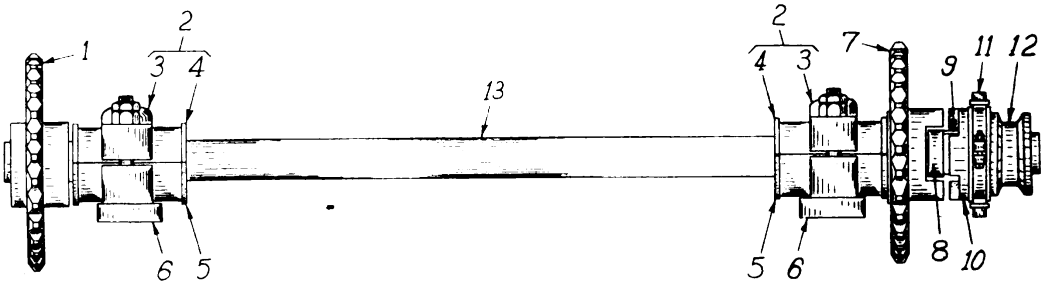


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	13-264-B	Pivot Bearing, (Complete)
	2		Flat Head Cap Screw, 3/8" x 3/4"
2.	2	3366 A	Bearing
	2		1/4" Hydraulic Alemite, Male
3.	2	E-13-262	Bearing Pivot (Loose)
4.	2	D-13-262 W	Bearing Pivot (Base)
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
5.	2	136	Collar
	2		Low Head, Set Screw, 5/8" x 7/8"
6.	2	3613	Sprocket, 16-Tooth
	2	AN-17-33	Key, 1/2" x 1/2" x 4-1/4"
	2		Set Screw, 1/2" x 1"
	2		Set Screw, 1/2" x 1-1/8"
7.	1	B-831-226	Shaft, 1-15/16" x 3' 1-3/4" S.A.E. 4140

ELEVATOR COUNTER SHAFT

(B/M 831-225-A)

See Parts List on following page.



Elevator Counter Shaft (Continued)

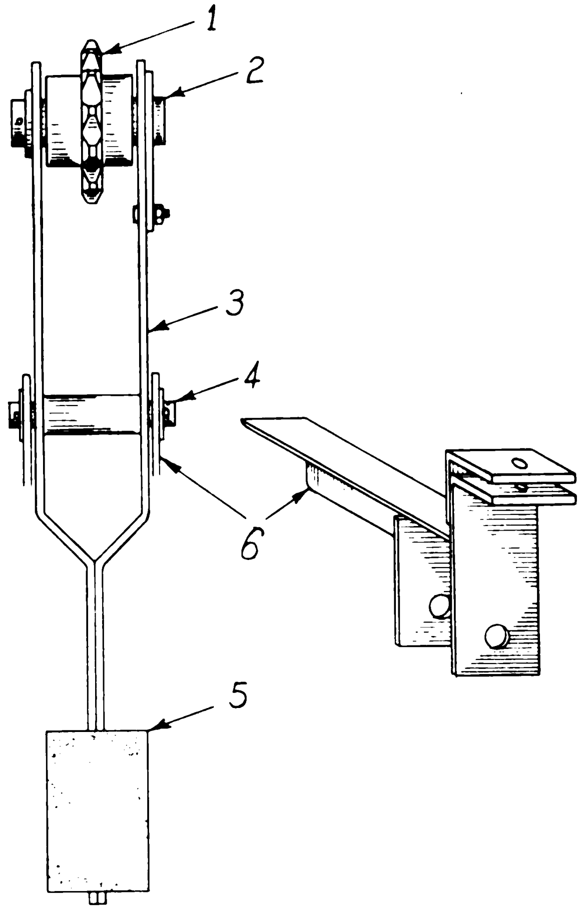
(B/M 831-225-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	19-474-EE	Sprocket, 29-Tooth
	1	I-17-32	Key, 3/8" x 3/8" x 2-5/8"
	1		Set Screw, 1/2" x 1"
	1		Set Screw, 1/2" x 1-1/4"
2.	2	13-210-B	Ball & Socket Bearing (Complete)
	4		Machine Bolt, Nut, & Half Nut, 5/8" x 5-3/4"
3.	2	822 A	Bearing Cap
4.	2	1312	Bearing, Upper Half
	2	G-17-43	Pipe, 1/4" x 2-1/4"
	2		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
5.	2	1312 A	Bearing, Lower Half
6.	2	821	Bearing Base
	4		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/4"
	2	BT-17-109	Shim, 16 Ga.
7.	1	A-19-851 W	Sprocket, 29-Tooth
	2	U-8-55	Bronze Bushing
	1		1/4" Hydraulic Alemite, Male
8.	1	G-3-938	Collar
	2		Allen Cup Point Safety Set Screw, 3/8" x 5/8"
9.	1	DD-17-107	Feather Key, 3/8" x 3/8" x 3-3/4"
10.	1	2864 E	Jaw Clutch
11.	1	2427	Shifter Yoke
	2		Machine Bolt, Nut, & Lock Washer, 3/8" x 2-1/4"
	1		1/8" Hydraulic Alemite
12.	1	183	Collar
	1		Low Head Set Screw, 1/2" x 5/8"
13.	1	A-831-225	Shaft, 1-11/16" x 4' 1-5/16" S.A.E. 1045

Always give Serial Number of Machine, Parts Number and Description.

COUNTER SHAFT IDLER

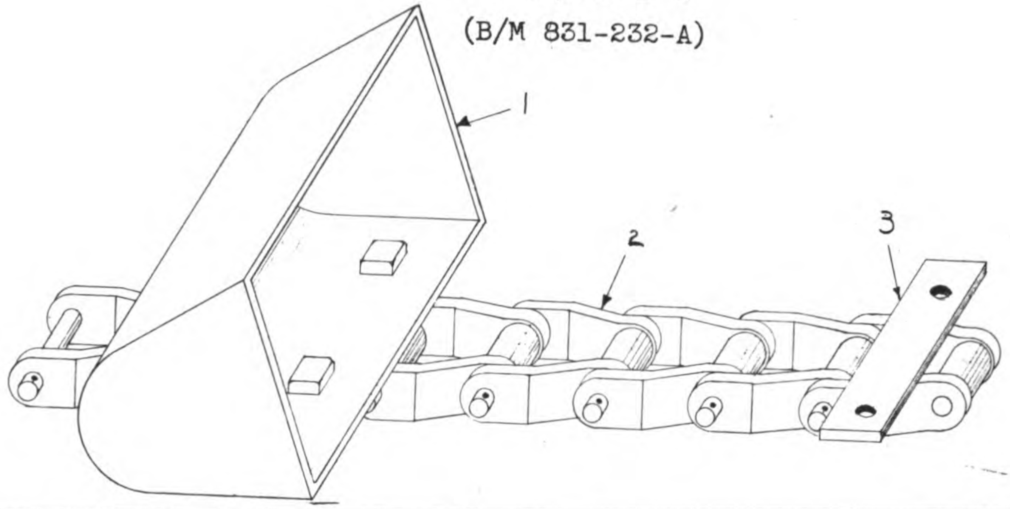
(B/M 831-224-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	B-19-804	Sprocket, 13-Tooth
	2	B-8-25	Bronze Bushing
2.	1	D-831-224 W	Pin
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1		1/8" Hydraulic Alemite, Male
	1	S-17-9	Washer
	1		Cotter, 1/4" x 2-1/2"
3.	1	J-831-223 W	Bracket
4.	1	QQ-17-25	Shaft, 3/4" x 5-1/16" S.A.E. 1020
	2		Cut Washer, 3/4"
	2		Cotter, 1/4" x 1-1/2"
5.	1	740	Counter Weight
	1		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-3/4"
6.	1	F-831-223 W	Pivot Bracket
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"

BUCKET

(B/M 831-232-A)

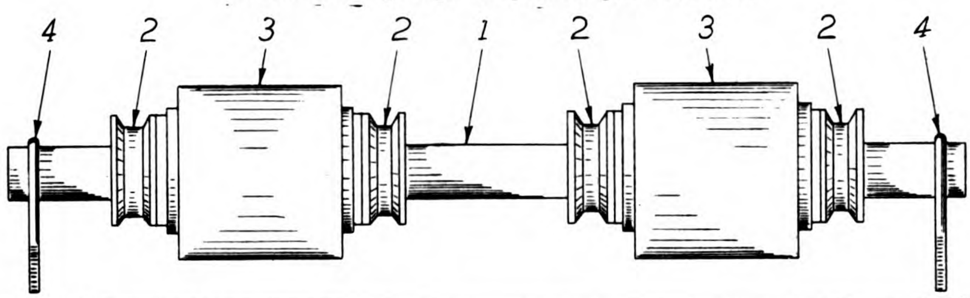


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	52	J-46-250	Bucket, Style "A", 8" x 5" x 5-1/2"
	104		Machine Bolt, Nut, & Lock Washer, 3/8" x 1"
	2	A-831-232 W	Strand 130 Riveted Links and 2 cottered links "Chabelco" A-508 Chain with D-6-29 W attachment every fifth link
2	2		Plain Link "Chabelco" A-508 Chain with coupler pin and cotter
3	2	D-6-29 W	Attachment link "Chabelco" A-508 Chain with coupler pin and cotter.

BUCKET LINE IDLER

(B/M 831-224-C)

NOTE: Two groups required per machine

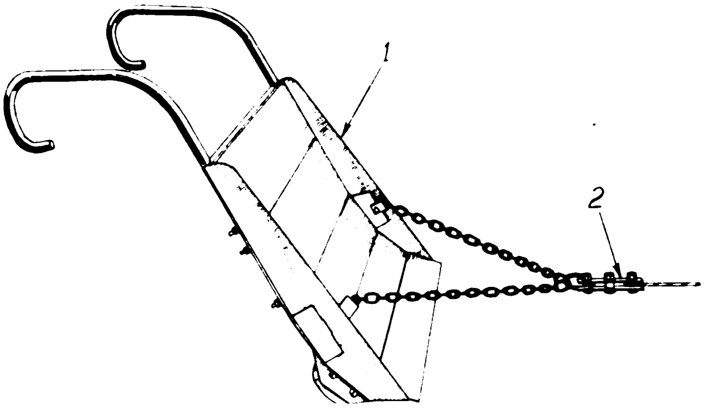


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	(B/M 831-224-C)	Bucket Line Idler (Complete)
1.	1	K-831-223	Shaft, 1-11/16" x 2' 9-3/4" S.A.E. 1020
2.	4	183	Collar
	4		Low Head Set Screw, 1/2" x 5/8"
3.	2	2569 B	Roller
	2		1/4" Hydraulic Alemite, Male
4.	2	B-46-155	U-Bolt
	4		Hex Nut, 1/2"
	4		Lock Washer, 1/2"

Always give Serial Number of Machine, Parts Number and Description.

D R A G   S C O O P

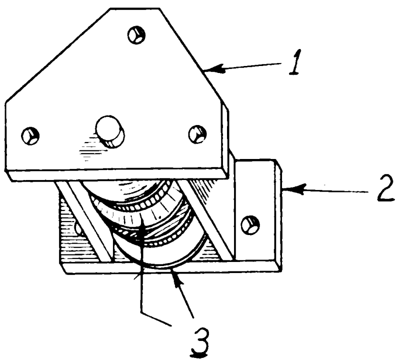
From B/M 831-73-A; B/M 831-73-B



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	(B/M 831-73-A	Scoop (Complete)
2.	4	M-831-73	Connecting Bar
	6	C-17-10	Pipe Spacer
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
	2	868A	Sheave
	2	B-17-82	
	2	A-17-84	
	4		3/4" half hex nuts
	2		1/8" x 90° hydraulic Alemite

ELEVATOR DRAG LINE SHEAVE BRACKET

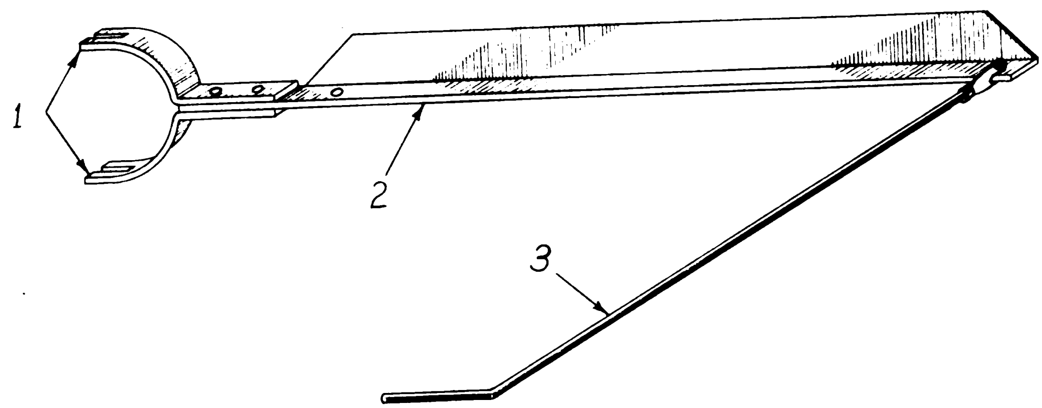
(B/M 831-73-B)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	K(R)-831-73 W	Pin (Front, shown above)
	1	K(L)-831-73 W	Pin (Rear, not shown)
	8	AK-17-9	Washer
	2		Cotter, 1/4" x 1-1/2"
2.	2	P-831-73 W	Keeper Bracket
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 5"
3.	4	2421	Sheave

ELEVATOR CLUTCH LEVER

(B/M 831-224-A)

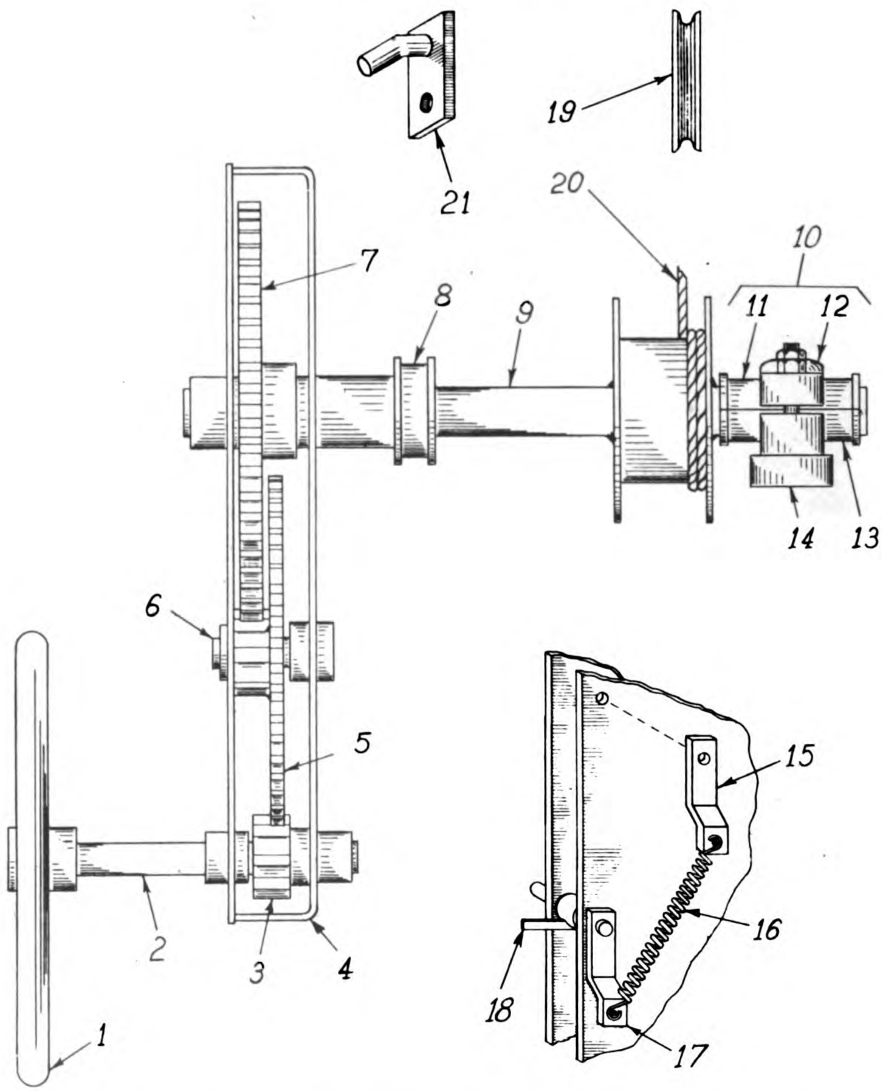


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	A-831-223	Half Yoke
	2		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/2"
2.	1	G-831-223	Lever Arm
	1		Machine Bolt, 1/2" x 2-1/4"
	2		Cut Washer, 1/2"
	2		Half Nut, 1/2"
3.	1	A-831-224	Rod
	1	B-3-149	Yoke End
	1	C-17-23	Rivet
	1		Cotter, 1/8" x 1"
	1		Hex Nut, 3/4"
	1	HH-17-9	Washer

Always give Serial Number of Machine, Parts Number and Description.

ELEVATOR HAND HOIST

(B/M 831-234-A)



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	125 H	Hand Wheel
	1	H-17-30	Key, 1/4" x 1/4" x 2-1/2"
	2		Set Screw, 3/8" x 1"
2.	1	E-831-234	Shaft, 1" x 1' 0-1/4" S.A.E. 1020
3.	1	E-18-204	Pinion, 10-Tooth
	1	EW-17-26	Pin, 5/16" x 2-1/4"
4.	1	P-831-235 W	Hoist Housing
	6		Machine Bolt, Nut, & Lock Washer, 1/2" x 3-3/4"
	4		Machine Bolt, Nut, & Lock Washer, 1/2" x 1-1/4"
	1	AW-17-43	Pipe, 1/8" x 2"

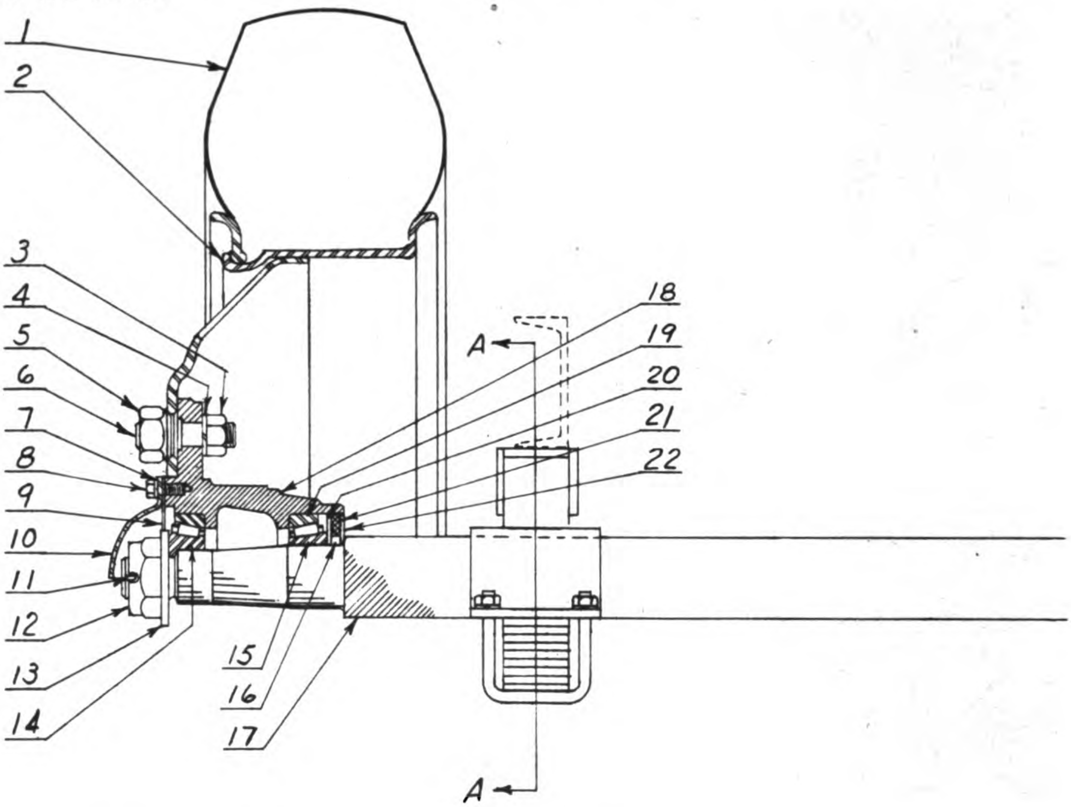
Elevator Hand Hoist (Continued)
(B/M 831-234-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1		Pipe Coupling, 1/8"
	3		1/8" Hydraulic Alemite, Male
	1	G-17-43	Pipe, 1/4" x 2-1/4"
	1		Pipe Coupling, 1/4"
	2		1/4" Hydraulic Alemite, Male
5.	1	18-204-A	10-Tooth Pinion & 48 Tooth Gear
6.	1	D-10-211 W	Pin
	1		Cotter, 3/16" x 3"
	1		1/4" Hydraulic Alemite, Male
7.	1	18-258-E	Gear, 58-Tooth
	1	A-17-32	Key, 3/8" x 3/8" x 1-7/8"
	1		Allen Cup Point Safety Set Screw, 1/2" x 3/4"
	1		Allen Cup Point Safety Set Screw, 1/2" x 1"
8.	1	183	Collar
	1		Low Head Set Screw, 1/2" x 5/8"
9.	1	D-831-234 W	Drum & Shaft
10.	1	13-210-B	Ball & Socket Bearing (Complete)
	2		Machine Bolt, Nut, & Half Nut, 5/8" x 5-3/4"
11.	1	1312	Upper Bearing Half
	1	A-13-50	Pipe, 1/4" x 1-3/8"
	1		1/8" Hydraulic Alemite, Male
12.	1	822 A	Bearing Cap
13.	1	1312 A	Lower Bearing Half
14.	1	821	Bearing Base
	2		Machine Bolt, Nut, & Lock Washer, 5/8" x 2-1/4"
	5	BT-17-109	Shim, 16 Ga.
15.	1	U-831-235	Arm
	1		Machine Bolt, 1/2" x 1-1/2"
	2		Half Nut, 1/2"
16.	1	D-46-154	Spring
	2		Round Head Stove Bolt, 1/4" x 3/4"
	4		Nut, 1/4"
17.	1	V-831-235 W	Pin Arm
18.	1	Y-831-235 W	Pawl
	1	CB-17-26	Pin, 3/16" x 1-1/4"
19.	1	868 A	Sheave
	1	K-17-14	Bushing
	1		Machine Bolt, Nut, & Lock Washer, 3/4" x 3-1/4"
20.	1		Cable, 3/8" x 24'
	3		Cable Clamp, 3/8", 6 x 19 Crucible Cast Steel
	1		Cable Thimble, 3/8"
21.	1	BB-831-235 W	Cable Anchor

W H E E L S   A N D   A X L E S

(B/M 831-236-A)

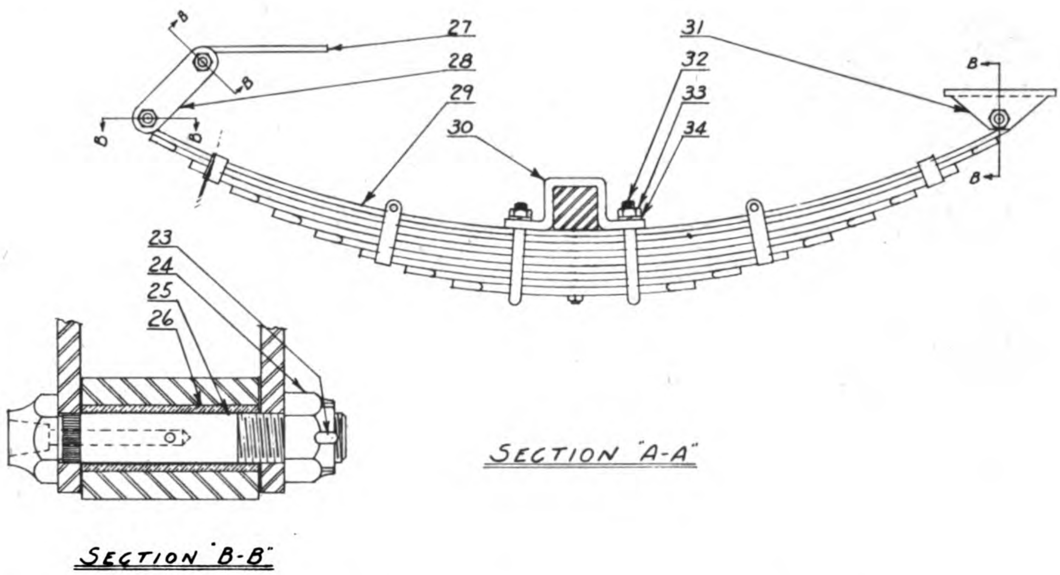
NOTE: * = Barber-Greene part number. All other parts can be ordered by number from either Barber-Greene or Liggetts Spring & Axle Co.



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	T1-G-S1*	7.50" x 20" x 8-Ply heavy duty speed liner tires B.F. Goodrich
	2	TU-G-S1*	7.50" x 20" regular heavy duty tubes B.F. Goodrich
			20" x 5.00 S Wheel with rim
2.	2	WH-PD-A1*	Wheel with 5.00" "S" Rim
	1	AX-L1-A1	Axle Hubs & Springs (includes items 3 thru 34)
3.	12	X39-8	Wheel Stud Lock Nut
4.	12	X7-25	Wheel Stud Lock Washer
5.	6	10706 B	Hub Stud Nut (opposite hoist side)
	6	10707 B	Hub Stud Nut (hoist side)
6.	6	12247 B	Hub Stud (opposite hoist side)
	6	12248 B	Hub Stud (hoist side)
7.	8	X7-4	Hub Cap Attaching Bolt Washer
8.	8	X34-8	Hub Cap Attaching Bolt
9.	2	15527	Hub Cap Gasket
10.	2	15513	Hub Cap
11.	2	X32-10	Spindle Cotter
12.	2	X37-59	Spindle Nut
13.	2	X35-5	Spindle Washer
14.	2	3782	Timken Outer Cone
15.	2	3780	Timken Inner Cone
16.	2	15643	Loose Collar
17.	1	X160-34	Axle Beam (2" Square, 59" Track)
	3		1/8" Hyd. Alemite, Male

Wheels and Axles (Continued)

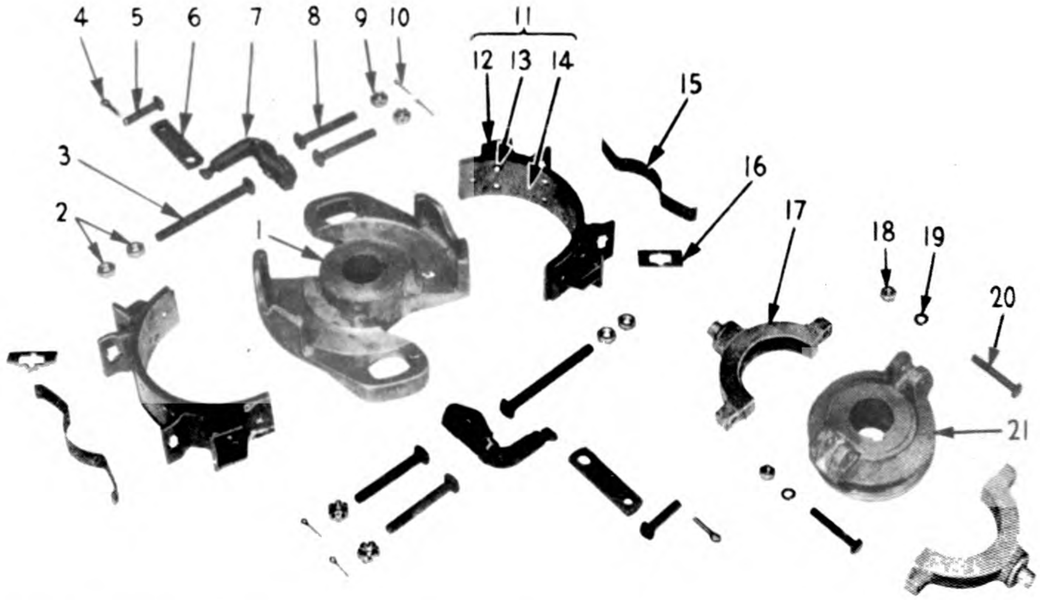
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
18.	1	15524	Hub & Stud Assembly (opposite hoist side)
	1	15525	Hub & Stud Assembly (hoist side)
	2	15514	Hub Sub-Assembly (with Timken Cups Only)
19.	4	3720	Timken Inner & Outer Cups
20.	2	X33-12	Grease Retainer Outer Washer
21.	2	X31-9	Grease Retainer Felt Washer
22.	2	X33-61	Grease Retainer Inner Washer



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
23.	6	X32-10	Spring Shackle Bolt Cotter
24.	6	X37-16	Spring Shackle Bolt Nut
25.	6	X19-7	Spring Shackle Bolt
26.	6	X6-24	Spring Bushing
27.	2	X17-11	Rear Spring Hanger
28.	4	X18-10	Spring Shackle Link
29.	2	100-LIG	Spring Assembly (2" x 9 Leaf x 37-7/8")
30.	2	X20-23	Axle to Spring Clamp
31.	2	X16-13	Front Spring Hanger
32.	4	X21-39	U-Bolt
33.	8	X38-5	U-Bolt Nut
34.	8	X7-13	U-Bolt Washer

Always give Serial Number of Machine, Parts Number and Description.

B-G 8" FRICTION CLUTCH



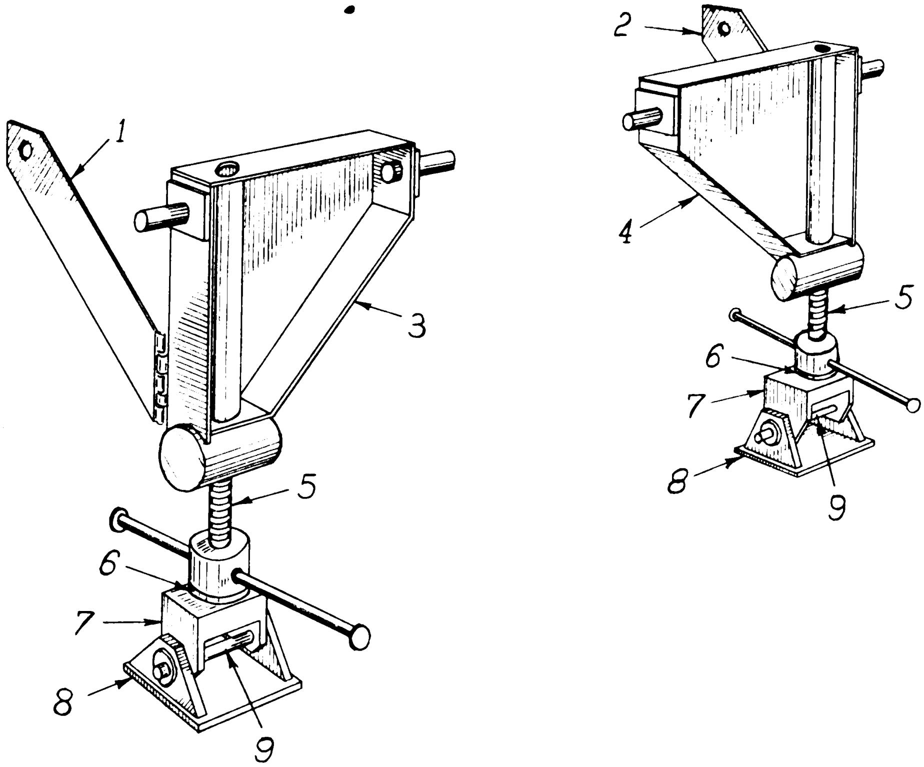
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	*	Clutch Carrier
2.	4		Half Nut, 1/2"
3.	2	C-46-208	Machine Bolt, 1/2" x 5-3/4"
4.	2		Cotter, 1/8" x 1"
5.	2	C-3-1011	Toggle Pin
6.	2	A-3-1011	Toggle Link
7.	2	A-3-1010	Clutch Lever
8.	4	B-46-208	Machine Bolt, 1/2" x 3-1/2"
9.	4	D-46-208	Slotted Nut 1/2"
10.	4		Cotter, 1/8" x 1-1/4"
11.	2	A-3-1008 WR	Clutch Band Half (Complete)
13.	24		Rivet
14.	2	F-3-1008	Clutch Lining
15.	2	B-3-1011	Spring
16.	1	A-3-1007	Shim, 10 Ga.
16.	1	C-3-1007	Shim, 14 Ga.
17.	1	897	Shifter Yoke
18.	2		Hex Nut, 3/8"
19.	2		Lock Washer 3/8"
20.	2		Machine Bolt, 3/8" x 2-1/4"
21.	1	*	Shifter Collar

* In ordering clutch parts, note that different shaft sizes require a different carrier and shifter collar part number, as below:

Clutch 3-1007-A has 1-15/16" shaft, takes carrier #3436 and collar #3438
Clutch 3-1007-B has 1-11/16" shaft, takes carrier #3436A and collar #3438A
Clutch 3-1007-C has 2-3/16" shaft, takes carrier #3436B and collar #3438B

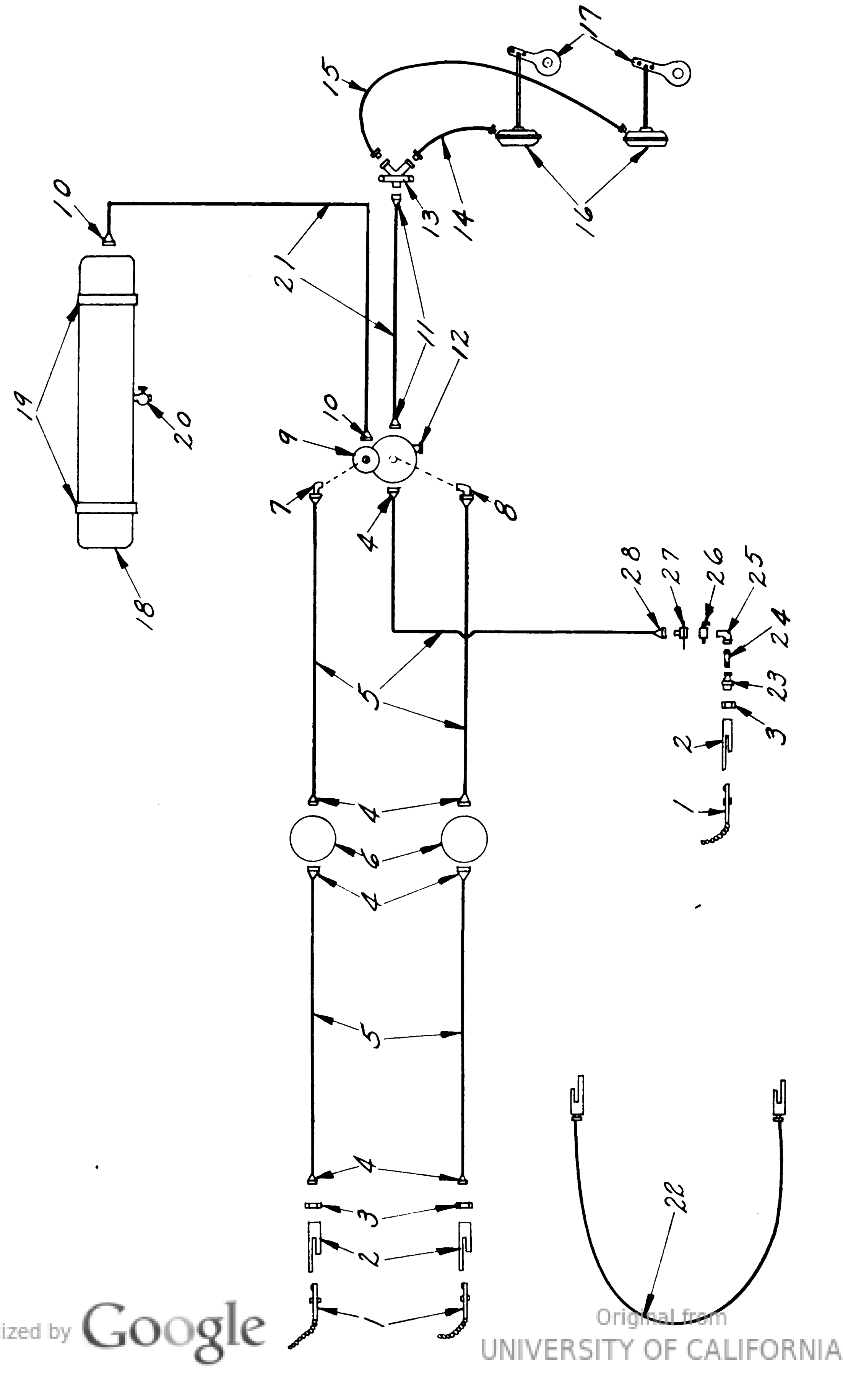
J A C K L E G S

From B/M 841-182-A; B/M 831-160-A, and B/M 821-156-A



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	EE ·(L) 831-161 W	Pivot Arm
	1	KG-17-25	Rod
	2		Cotter, 1/8" x 1"
	1		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
2.	1	EE (R) 831-161 W	Pivot Arm
	1	KG-17-25	Rod
	2		Cotter, 1/8" x 1"
	1		Machine Bolt, Nut, & Lock Washer, 5/8" x 2"
3.	1	F (R) 831-161 W	Pivot Bracket
	2	CE-17-9	Washer
	2		Cotter, 3/8" x 2-1/2"
	1		1/8" Hydraulic Alemite, Male
4.	1	F (L) 831-161-W	Pivot Bracket
	2	CE-17-9	Washer
	2		Cotter, 3/8" x 2-1/2"
	1		1/8" Hydraulic Alemite, Male
5.	2	J-831-161-W	Take Up Screw
	2	NG-17-9	Washer
	2		Cotter, 3/8" x 3"
6.	2	BB-831-161	Bronze Washer
7.	2	Q-831-161-W	Pivot Bracket
8.	2	N-831-161-W	Pivot Base
9.	2	CJ-17-25	Shaft, 1" x 6-3/8" S.A.E. 1020
	4	N-17-9	Washer
	4		Cotter, 1/4" x 2"

B/M 821-201-A; B/M 831-156-A and B/M 841-208-A



Air Brake Control (Continued)

B/M 821-201-A; B/M 831-156-A and B/M 841-208-A

COMMON TO ALL

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	3	220636	Dummy Hose Coupling
2.	3	220165	Lock Type Hose Coupling
3.	3	205730	Clamping Stud
4.	7	205053	Connector 3/8" Tube x 1/4" Pipe Thread
6.	2	221022	Type "E" Filter 3/8" Pipe Tap (For Setails See Accessory Section)
7.	1	205829	Elbow 3/8" Tube x 3/8" Pipe Thread
8.	1	205102	Elbow 3/8" Tube x 1/4" Pipe Thread
9.	1	220353	Relay Emergency Valve (For Details See Accessory Section)
10.	2	217525	Connector 1/2" Tube x 3/8" Pipe Thread
11.	2	217690	Connector 1/2" Tube x 1/4" Pipe Thread
12.	1	221087	Exhaust Check Valve
13.	1	201708	Tubing "Y" 1/4" x 1/4" Pipe Taps
14.	1	217097	Flexible hose x 2'-6" with 2 connections
15.	1	215771	Flexible hose x 3'-6-1/2" with 2 connections
18.	1	215660	7" x 24" Reservoir
19.	2	205267	Reservoir Bracket
20.	1	215310	1/4" Drain Cock
22.	2	215605	Flexible Connecting Hose Assembly 125-5/8" Center to center of couplings
23.	1		1/2" to 3/8" Reducer coupling
24.	1		3/8" Close Nipple
25.	1		3/8" x 90° Street Elbow
26.	1	220745	Cut out cock
27.	1	215672	Anchor coupling 3/8" x 3/8" Pipe
28.	1	205824	Connector 3/8" Tube x 3/8" Pipe Thread
	1	201500	Service connection tag
	1	201499	Emergency connection tag

For Model 821 Only

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5	1		TUB-BE-A1 3/8" Tubing x 44'-9"
5	1		LM-BE-A1 7/16" Loom x 44'-9"
21	1		TUB-BE-A2 1/2" Tubing x 6'-10"
21	1		LM-BE-A2 9/16" Loom x 6'-10"
	3		1/4" x 90° Street Elbow

For Model 831 Only

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5	1		TUB-BE-A1 3/8" Tubing x 50'-0-1/2"
5	1		LM-BE-A1 7/16" Loom x 50'-0-1/2"
21	1		TUB-BE-A2 1/2" Tubing x 6'-10"
21	1		LM-BE-A2 9/16" Loom x 6'-10"

For Model 841 Only

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5	1		TUB-BE-A1 3/8" Tubing x 32'-1"
5	1		LM-BE-A1 7/16" Loom x 32'-1"
21	1		TUB-BE-A2 1/2" Tubing x 4'-0"
21	1		LM-BE-A2 9/16" Loom x 4'-0"

R E A R   A X L E

(B/M 831-208-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	WA-TC-A1	Axle Complete Including Wheel Hub with Bearings, Lugs and Nuts; Foundation Brakes Including Slack Adjuster, Bendix-Westinghouse Actuating Diaphragm; Springs, Radius Arms, Spring Shackles (Less Spring Hanger Brackets #3-1-13 and #3-1-14) (For Details See Accessory Section)
	4	T1-G-S1	7.50 x 20, 8 PLY Heavy Duty Speed-Liner Tire
	4	TU-G-S1	7.50 x 20, Regular Heavy Duty Tube
	4	WH-PD-A1	20"-5.00S, Disc Wheel & Rim (For Details See Accessory Section)

T O W I N G   P I N T L E

(B/M 841-157-A)
(B/M 821-203-A)
(B/M 831-178-A)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	PN-PD-A1	Pintle Assembly Complete, QM #C-57093X (See Accessory Section)

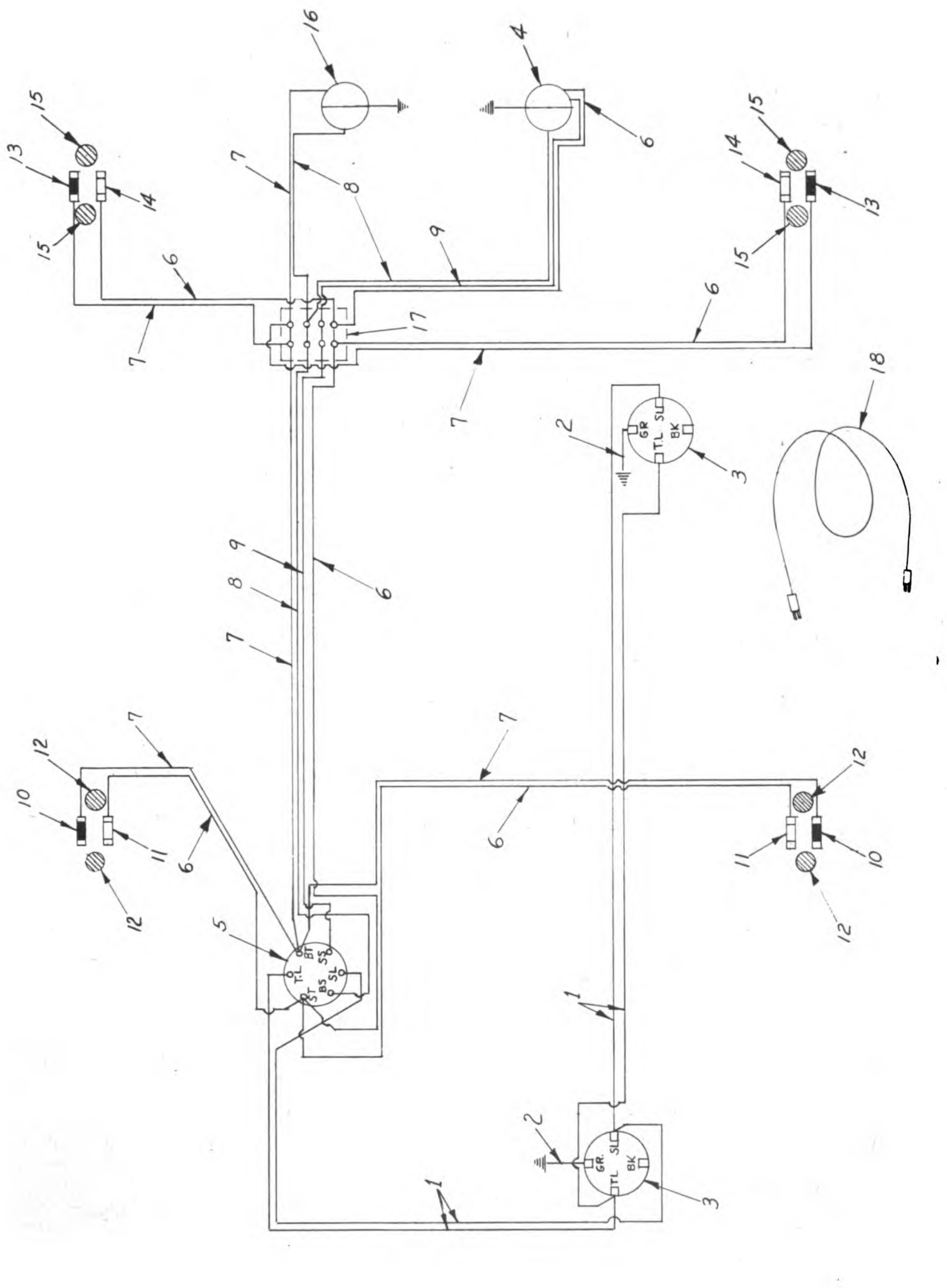
L I G H T I N G   S Y S T E M

From B/M 821-197-A; B/M 831-201-A and B/M 841-178-A

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1		#12 Ga.-2 Heavy Duty Conductor Automotive Cable, 33'-0" on 821; 39'-6" on 831; 28'-6" on 841
	1		9/16" I.D. Loom, 5'-6" on 821; 9' on 831; 5' on 841
	2	EL-SO-C1-1	Socket, 4 Point #3529
	2	EL-SO-C1-2	Socket, Cover #11935-B
2.	2		#10 Ga., Single, Automotive Light Circuit Cable, 8"
3.	2	EL-SO-C1	4 Point Socket Per Quarter Master Drawing #07950-W
4.	1	EL-LA-E1	Service Stop and Tail Lamp and Blackout Stop Lamp Per Quarter Master Drawing #08242-X (Includes the Following Four Items) #950-I6
	1	EL-LA-E1-1	Seal Beam Lamp Service Tail and Stop Lamp #8039-6V-21 C.P.
	1	EL-LA-E1-2	Seal Beam Lamp For Blackout Stop Lamp #8040-6V-3 C.P.
	1	EL-LA-E1-3	Lamp Body #8045
	1	EL-LA-E1-4	Lamp Cover Plate #2460

Lighting System (Continued)

(For 821-831-841)



Lighting System (Continued)

From B/M 821-197-A; B/M 831-201-A and B/M 841-178-A

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
5.	1	EL-SW-C1	Blackout Switch Per Quarter Master Drawing #08761-W
6.	1		#14 Ga. Single, Automotive Light Circuit Cable, (Green with Red Tracer) 49'-6" on 821; 57' on 831; 56' on 841.
7.	1		#14 Ga. Single, Automotive Light Circuit Cable, (Black) 47' on 821; 54' on 831; 49'-6" on 841.
8.	1		#14 Ga. Single, Automotive Light Circuit Cable, (Blue) 41' on 821; 36'-6" on 831; 31' on 841.
9.	1		#14 Ga. Single, Automotive Light Circuit Cable, (Red) 32' on 821; 27'-6" on 831; 28' on 841.
	1		3/8" I.D. Loom, 55'-6" on 821; 62' on 831; 38'-4" on 841.
10.	2	EL-LA-F1	Blackout Clearance Lamp (Blue) #541-BO
11.	2	EL-LA-G1	Amber Clearance Lamp #541-OD
12.	4	RE-KD-A1	Amber Reflector #A-2042-1A #333 Round
	8		Round Head Stove Bolt, Nut, & Lock Washer, 1/4" x 1/2"
	8		Bulb 6V-2 C.P. (For 10, 11, 13 & 14)
13.	2	EL-LA-F2	Blackout Clearance Lamp (Red) #541-BO
14.	2	EL-LA-G2	Red Clearance Lamp #541-OD
15.	4	RE-KD-A2	Red Reflector #A-2042-1A #333 Round
	8		Round Head Stove Bolt, Nut, & Lock Washer, 1/4" x 1/2"
16.	1	EL-LA-E2	Blackout Stop and Tail Lamp Per Quarter Master Drawing #08243-X, #951-I6 (Includes the Following Four Items)
	1	EL-LA-E2-1	Seal Beam Lamp for Blackout Tail Lamp #8041-6V-3 C.P.
	1	EL-LA-E2-2	Seal Beam Lamp for Blackout Stop Lamp #8041-6V-3 C.P.
	1	EL-LA-E2-3	Lamp Body #8045
	1	EL-LA-E2-4	Lamp Cover Plate #2460
17.	2	EL-CB-A1	Connection Block, 5 Wire, Composition, 20 AMP - 125V
	4	N-821-196	Brass Jumper Strip
18.	1	EL-CA-F1	Connecting Cable, 12'-0" Long, with 4 Point Plugs on Each End Per Quarter-Master Drawing #07955-W
	12		Brass Machine Screw, Nut and Two Washers, #6-32 x 1/2"
	32		Round Head Stove Bolt, Nut, & Lock Washer, 3/16" x 1-1/2"

NUMERICAL INDEX
PUGMILL MIXER PLANT

(For Engine Parts and Index, See Accessory Section).

"No. Req." is total for the entire parts list.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Part No.	Page	No. Req.	Lbs. Each	Unit Price
B-3-149	438	26	.5	.36
	439			
	440			
	442			
	467			
	468			
	469			
	512			
	525			
D-3-475	413	32	.4	.12
	414			
A-3-604	410	18	.4	.24
	441			
	442			
	470			
	513			
C-3-841	433	1	.1	.38
E-3-841	432	1	.1	.30
G-3-926	433	1	1.8	6.25
B-3-932	468	5	.5	.94
	502			
	506			
	519			
T-3-932	439	6	.4	.65
	512			
CC-3-935	488	9	1.0	1.02
	491			
FF-3-935	463	1	1.2	1.58
GG-3-935	432	3	.5	1.31
	433			
	434			
K-3-935	421	9	1.0	1.50
	422			
	485			
	489			
NN-3-935	471	4	.6	.92
B-3-936	463	1	.4	.59
C-3-938	473	2	1.0	1.71
G-3-938	473	4	1.2	1.26
	492			
	497			
	521			
V-3-938	408	2	1.7	1.40
	428			
S-3-939	408	1	.3	.75
A-3-941	453	3	3.0	1.78
	454			
E-3-941	416	2	.6	1.08
	448			
O-3-941	498	3	1.0	1.30
	499			
Q-3-944	485	1	2.0	1.64
A-3-951	438	2	.8	.72
C-3-951	467	5	.5	.66
	511			
F-3-951	512	2	.5	.90
T-3-951	499	1	.4	.90
A-3-987	442	1	.3	1.10
3-1007-A	407	7	46.8	39.00
	418			
	453			
	454			
	507			
	508			
3-1007-C	485	1	45.3	39.00
A-3-1007	530	8	.1	.06
C-3-1007	530	8	.1	.06
A-3-1008WR	530	16	.4	3.88
F-3-1008	530	16	.4	.89
A-3-1010	530	16	1.2	.97
A-3-1011	530	16	.4	.54
B-3-1011	530	16	.1	.18
C-3-1011	530	16	.1	.15
A-3-1028W	438	2	1.8	1.95
F-3-1028	439	11	.4	.29
	467			
	511			
H-3-1028W	438	1	1.3	2.02
E-3-1029W	409	1	5.7	3.00
G-3-1032W	442	4	1.5	1.95
	470			
	514			
J-3-1032W	410	3	2.0	1.80
	440			
K-3-1032W	439	2	1.5	1.75
E-3-1097	471	8	3.4	3.30
	491			
K-3-1122	468	2	.4	.05
A-3-1149	413	32	2.5	1.14
	414			
C-3-1149W	413	1	9.5	4.81
D-3-1149W	414	1	9.5	4.81
A-3-1150	411	4	4.5	2.80
	414			
B-3-1150	413	14	4.5	.48
	414			
D-3-1150	413	2	8.8	4.88
	414			
A-3-1152	432	1	2.5	7.00
G-3-1154W	438	1	3.0	3.25
M-3-1154W	512	1	3.0	3.25
C-3-1158S	436	1	.2	1.95
B-3-1166	408	1	3.0	9.33
A-3-1182	463	1	3.8	12.54
A-3-1192W	418	1	12.8	17.50
B-3-1195	425	6	2.0	2.52
A-3-1196W	440	1	5.3	2.88
C-3-1196	440	2	6.3	1.26
D-3-1196W	439	1	7.3	2.72
A-3-1197W	442	1	6.5	3.20
B-3-1197W	470	2	6.9	2.90
	514			
F-3-1197	442	3	.5	.47
	470			
	514			
G-3-1197	442	3	.2	.34
	470			
	514			
H-3-1197	470	2	.6	.12
	514			
J-3-1197	470	2	.1	.05
	514			
K-3-1197	470	2	.1	.05
	514			
M-3-1197	442	3	3.5	1.80
	470			
	514			
A-3-1198W	438	1	9.8	3.71
E-3-1198W	438	1	7.0	2.84
C-3-1201A	430	1	4.0	5.31
E-3-1206W	512	1	8.0	3.02
E-3-1210W	452	4	41.3	18.10
	454			
	507			
	508			
B-3-1218W	512	1	3.8	2.79

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
A-6-18	496	40	.3	.06
B-6-18	496	40	.3	.06
A-6-19	496	2	.1	.06
B-6-19	496	78	.1	.06
D-6-22	496	20	.9	.40
E-6-22	496	20	.9	.40
X6-24	529	6		.27
E-6-26R	496	2	35.0	12.80
A-6-51	404	—	.1	.22
B-6-51	404	—	.1	.09
BE-6-51R	404	1	4.8	4.24
BJ-6-51C	404	1	5.0	4.72
BO-6-51R	404	1	5.3	4.74
C-6-51	404	2	.1	.29
EQ-6-51C	404	1	9.8	9.33
IK-6-51RC	404	1	15.3	13.21
A-6-58	448	—	.1	.18
	483			
	518			
AF-6-58C	483	1	7.8	7.36
AQ-6-58C	483	1	9.2	8.42
AT-6-58C	483	1	9.7	9.14
AV-6-58C	483	1	10.0	9.40
B-6-58	448	—	.1	.14
	483			
	518			
BK-6-58C	448	1	12.0	11.18
BR-6-58C	483	1	12.9	11.73
C-6-58	448	—	.2	.47
	483			
	518			
CD-6-58C	483	1	14.5	13.48
CO-6-58C	483	1	16.0	14.54
CW-6-58C	518	1	17.1	15.56
DE-6-58C	483	2	18.1	16.79
EK-6-58C	448	1	22.4	20.40
QQ-6-58C	448	1	5.9	5.36
YY-6-58C	448	1	6.9	6.59
ZZ-6-58C	483	1	7.0	6.38
A-6-64	448	—	.3	.27
	483			
	404			
AS-6-64C	404	1	17.9	12.74
AZ-6-64C	448	1	19.8	14.47
B-6-64	448	—	.3	.20
	483			
	404			
BM-6-64C	404	1	22.9	16.72
BS-6-64C	483	1	24.5	17.84
C-6-64	448	—	.3	.61
	483			
	404			
EW-6-64C	483	1	45.2	32.22
XX-6-64C	448	1	12.6	8.99
A-6-114	448	—	.7	.33
AT-6-114R	448	1	45.5	22.77
X7-4	528	8		.01
X7-13	529	8		.01
X7-25	528	12		.02
B-8-25	502	8		.63
	506			
	519			
	522			
H-8-32	471	8		.82
	491			
N-8-32	463	1		1.74
C-8-35	428	8		.72
	431			
	432			
	434			
D-8-35	418	8		.86
	472			
	485			
	491			
E-8-51	408	1		1.55
B-8-54	456	2		1.12
K-8-55	488	2	—	.81
M-8-55	473	2	—	.63
U-8-55	492	6		.84
	497			
	521			

Part No.	Page	No. Req.	Lbs. Each	Unit Price
H-8-74	416	2		1.50
A-8-75	418	1		1.62
G-8-75	452	8		1.40
	454			
	507			
	508			
H-8-75	418	1	1.1	1.05
J-8-75	448	1		.54
M-8-75	416	8		1.10
	448			
P-8-75	407	4		1.00
Q-8-75	448	1		.80
S-8-75	411	8		1.15
	414			
	451			
E-8-95	485	1		1.53
J-8-95	485	1		2.77
JJ-8-95	413	4		1.75
	414			
B-8-123	424	6		.80
A-13-45	420	4	.1	.26
	503			
A-13-50	419	3	.1	.24
	527			
13-210-B	408	5	19.0	5.94
	521			
	527			
13-210-H	473	13	18.5	6.86
	492			
	493			
	497			
	501			
	504			
	505			
13-210-J	505	1	20.7	5.22
13-211-C	419	2	8.7	5.94
13-213-C	452	12	19.6	7.98
	454			
	498			
	499			
	507			
	508			
13-213-E	451	2	18.0	12.57
13-213-K	457	8	27.6	8.11
	458			
13-213-O	411	2	24.4	11.82
	414			
13-213-P	416	5	21.0	11.00
	448			
13-219-D	413	2	45.2	23.50
	414			
13-228-C	502	2	7.4	3.10
13-229-A	420	2	4.9	3.58
D-13-262W	520	2	5.3	1.26
E-13-262	520	2	1.1	.36
13-264-B	520	2	18.2	5.65
A-13-271W	424	6	.5	2.88
A-14-54	423	2	3.0	.65
C-14-54	500	4		.61
A-14-56	424	20	3.3	.61
C-14-56	424	10	2.1	.54
H-14-56	424	10	.4	.41
C-14-57	423	1	1.2	.54
G-14-57	500	2	1.1	1.26
Z-14-72	461	6	.3	.01
B-14-139	461	2	.1	.02
14-148-E M&WU#1	461	2	5.0	4.25
D-14-172M	500	2	9.8	1.89
E-14-172M	424	30	3.7	1.08
G-14-172M	423	1		2.16
X16-13	529	2		.48
AG-17-9	492	9	.3	.06
	493			
	497			
	501			
	506			
AK-17-9	524	8	.3	.06
BD-17-9	497	1	.3	.03
CE-17-9	531	16	.3	.12
CF-17-9	472	2	.3	.06
	491			
CO-17-9	511	1	.3	.06

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
DD-17-9	407	7	.3	.09
	507			
	508			
DG-17-9	471	5	.3	.06
	488			
DM-17-9	442	9	.3	.06
	470			
	514			
FC-17-9	459	2	.3	.06
FE-17-9	459	4	.2	.06
G-17-9	431	1	.3	.07
GG-17-9	456	2	.3	.06
HH-17-9	410	3	.3	.06
	525			
JK-17-9	431	1		.06
KE-17-9	404	8	.3	.06
	480			
MT-17-9	489	4	.3	.06
MW-17-9	472	8	.3	.06
N-17-9	531	12	.3	.06
NG-17-9	531	6	.3	.06
NN-17-9	483	1	.3	.06
Q-17-9	456	8	.3	.03
S-17-9	522	1	.3	.07
V-17-9	416	1	.3	.06
Y-17-9	456	2	.3	.06
B-17-10	442	18	.1	.11
	461			
	467			
	468			
	470			
	511			
	514			
C-17-10	524	6	.1	.12
CC-17-10	511	1	.1	.12
T-17-10	511	1	.1	.10
ZZ-17-10	427	1	.1	.12
AC-17-11	469	1		.14
BE-17-11	511	1	.2	.09
J-17-11	461	4	.2	.10
X-17-11	529	2	.2	.18
O-17-12	427	1	.4	.16
V-17-13	427	2	.6	.16
K-17-14	527	1	.1	.18
U-17-15	428	1	.5	.18
BM-17-23	409	1	.2	.06
C-17-23	438	29	.2	.06
	439			
	440			
	441			
	442			
	467			
	468			
	469			
	512			
	525			
CP-17-23	410	8		.06
	441			
	442			
	470			
	513			
DC-17-23	442	2	.2	.06
	470			
	514			
O-17-23	418	1	.3	.06
Q-17-23	513	2	.2	.06
Y-17-23	468	1	.1	.06
BD-17-24	404	4	.5	.40
	480			
BG-17-24	446	2	.6	.26
BU-17-24	421	6	.7	.24
	422			
	503			
FF-17-24	519	2	2.2	1.87
K-17-24	491	8	.5	.12
	495			
	519			
M-17-24	519	2	.5	.12
CJ-17-25	531	8	1.5	.47
GE-17-25	430	1	.3	.40
JG-17-25	411	2	1.0	.40

Part No.	Page	No. Req.	Lbs. Each	Unit Price
JW-17-25	418	1	.7	.41
KG-17-25	531	6	.4	.36
QQ-17-25	522	1	.5	.54
CB-17-26	527	1	.1	.24
EW-17-26	526	1	.05	.12
P-17-26	427	1	.1	.18
AF-17-28	460	6	.3	.07
	498			
	503			
M-17-28	421	15	.3	.06
	422			
	430			
	463			
	485			
BB-17-30	433	1	.1	.08
C-17-30	410	19	.1	.08
	438			
	439			
	440			
	442			
	467			
	468			
	469			
	470			
	512			
	514			
E-17-30	442	3	.1	.09
	470			
	514			
FF-17-30	512	1		.09
H-17-30	526	1	.1	.09
N-17-30	409	2		.11
Q-17-30	429	1		.08
T-17-30	409	1	.5	.12
A-17-32	407	9	.1	.10
	408			
	421			
	422			
	527			
AP-17-32	430	1		.10
B-17-32	427	3	.1	.10
	463			
C-17-32	419	2		.11
E-17-32	493	1	.1	.12
H-17-32	430	2		.15
	501			
	502			
I-17-32	504	3	.1	.16
	521			
M-17-32	506	1		.15
O-17-32	503	2		.18
OO-17-32	461	1	.1	.18
XX-17-32	492	7	.1	.11
	501			
	504			
	505			
A-17-33	498	1		.15
AB-17-33	407	1		.16
AG-17-33	450	3	.1	.15
	452			
AH-17-33	451	1	.1	.18
AN-17-33	519	4		.19
	520			
AR-17-33	453	3	.1	.18
	454			
	508			
B-17-33	480	1		.18
C-17-33	446	1	.1	.20
	519			
D-17-33	450	1	.1	.18
T-17-33	498	4		.15
	499			
U-17-33	418	1	.1	.16
UU-17-33	483	1	.4	.21
W-17-33	485	1		.18
WW-17-33	404	3		.15
	407			
	507			
Z-17-33	450	2	.1	.18

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
ZZ-17-33	404	6	.3	.18
	418			
	452			
	454			
	507			
	508			
DD-17-34	413	2	.1	.24
	415			
UU-17-34	413	2	.2	.19
	414			
AA-17-38	487	2	1.2	.92
BB-17-38	488	2	.9	.72
F-17-39	413	1		.11
CC-17-41	432	1	.1	.08
O-17-41	486	1	.7	.24
Z-17-41	487	1	.3	.42
AE-17-43	457	2	1.0	.40
AF-17-43	448	11	.2	.07
	457			
	458			
AV-17-43	451	2		.07
AW-17-43	526	1		.05
BM-17-43	450	1		.20
BO-17-43	463	1		.12
BZ-17-43	488	1		.18
C-17-43	422	2	.1	.05
CA-17-43	433	1	.1	.06
D-17-43	488	2	.1	.04
	489			
E-17-43	486	3	.2	.04
	487			
EE-17-43	486	1	.5	.52
F-17-43	407	3	.1	.07
	418			
G-17-43	408	21	.2	.10
	473			
	492			
	493			
	497			
	504			
	505			
	521			
	527			
I-17-43	457	4	.1	.07
K-17-43	416	1	.1	.10
KK-17-43	411	2		.09
	414			
T-17-43	492	3	—	.14
	501			
U-17-43	450	1	.2	.09
X-17-43	413	1	.2	.13
M-17-71	415	1	.3	.07
N-17-71	431	2	.3	.06
B-17-82	453	2		.24
	454			
	509			
A-17-83	427	3	.5	1.32
	430			
A-17-84	453	2		.30
	454			
AE-17-106	407	4	.4	.22
	418			
	485			
AM-17-106	453	4	.5	.34
	454			
	507			
	508			
G-17-106	448	1	.2	.27
Y-17-106	416	1	.3	.32
AB-17-107	492	1	.1	.21
AE-17-107	473	1	.1	.30
AM-17-107	463	1	.1	.72
AN-17-107	408	1	.3	.40
DD-17-107	497	2	.1	.30
	521			
AY-17-109	457	24	.3	.06
	458			
BA-17-109	419	14	.3	.06
	430			
	433			
	463			
BC-17-109	419	14	.3	.06
	430			
	433			
	463			
BD-17-109	419	2	.3	.06
BE-17-109	433	1	.3	.06
BO-17-109	416	64	.3	.06
	450			
	451			
	452			
	454			
	473			
	492			
	493			
	497			
	499			
	501			
	504			
	505			
	506			
	507			
	508			
BP-17-109	416	35	.3	.06
	450			
	451			
	452			
	454			
	473			
	493			
	497			
	499			
	501			
	504			
	505			
	506			
	507			
BQ-17-109	492	16	.3	.06
	493			
	497			
	499			
	504			
	505			
	506			
BS-17-109	408	20	.3	.06
	504			
	505			
	506			
BT-17-109	521	7	.3	.06
	527			
V-17-109	503	4	.3	.06
VV-17-109	404	8	.3	.06
	480			
CG-17-111	485	27	.3	.06
	490			
CH-17-111	485	41	.3	.06
	490			
CK-17-111	459	8	.3	.06
CM-17-111	459	8	.3	.06
CN-17-111	459	16	.3	.06
F-17-111	413	2	.3	.06
	415			
QQ-17-111	413	66	.3	.06
	414			
	415			
	416			
	433			
	450			
	451			
	452			
	454			
	457			
	458			
	473			
	507			
	508			

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
SS-17-111	407	118	.3	.06
	408			
	413			
	414			
	415			
	419			
	433			
	450			
	451			
	452			
	454			
	458			
	473			
	492			
	493			
	497			
	501			
	504			
	505			
	506			
	507			
	508			
TT-17-111	407		.3	.06
	413			
	414			
	415			
	416			
	419			
	433			
	450			
	451			
	452			
	454			
	458			
	473			
	492			
	493			
	497			
	501			
	504			
	505			
	506			
	507			
UU-17-111	408	23	.3	.06
	413			
	414			
	415			
	416			
H-17-116	427	2	.5	.58
A-17-119	463	1	.1	.04
J-17-119	428	2		.14
	451			
JJ-17-119	451	1		.25
B-17-120	457	4		.14
C-17-120	450	1		.16
D-17-120	457	2		.40
F-17-120	459	2		.24
J-17-120	448	2		.44
A-17-122	465	1	—	.03
C-17-122	433	1		.07
A-17-128	434	3	1.0	.32
	465			
S-17-128	434	1	17.3	1.70
T-17-128	434	1	.2	.40
W-17-128	434	1	7.8	.40
B-17-130	465	3	3.2	.64
E-17-130	465	2	1.9	.61
J-17-130	465	1	69.5	6.45
BJ-17-139	467	2	.3	.06
BV-17-139	431	1	.3	.06
BW-17-139	431	2	.3	.06
DK-17-139	407	16	.3	.06
DO-17-139	470	5	.3	.06
	514			
DP-17-139	483	2	.3	.06
	485			
DQ-17-139	483	2	.3	.06
	485			
DS-17-139	483	2	.3	.06
	485			
E-17-139	413	6	.3	.06
	415			
F-17-139	415	1	.3	.06
G-17-139	413	2	.3	.06
	415			
AC-17-144	513	1	.5	.75
AD-17-144	410	2	.3	.43
AG-17-144	438	1	4.0	1.13
AH-17-144	467	2	5.3	1.22
BN-17-144	439	1	7.3	1.28
BP-17-144	438	1	5.5	.98
BT-17-144	440	1	3.8	.70
BV-17-144	470	1	.9	.74
BX-17-144	441	1	3.0	.83
BY-17-144	439	1	2.5	.90
C-17-144	513	2	.6	.50
CQ-17-144	470	2	.5	.52
CW-17-144	440	1	—	.83
DD-17-144	468	1		1.06
UU-17-144	441	2	1.5	.63
Y-17-144	442	1	.5	.53
YY-17-144	442	2	.4	.73
ZZ-17-144	469	1		.79
Q-17-145	512	1	.5	1.23
C-17-164	450	1	.5	.87
J-17-164	408	3	.4	.93
	504			
	505			
K-17-164	451	1	.4	1.35
P-17-165	413	2		.06
	414			
Q-17-165	413	2		.06
	414			
S-17-165	413	2		.06
	414			
A-17-189	413	2	1.5	1.25
	414			
C-17-189	407	1	.3	1.26
A-17-190W	435	2	10.9	4.40
C-17-190W	434	1	4.0	3.50
D-17-191W	435	2	11.0	6.70
G-17-191W	435	1	7.5	5.18
X18-10	529	4		.13
E-18-204	427	2	1.8	4.36
	526			
18-204-A	527	1	16.9	11.25
A-18-238	450	2	18.0	31.65
18-258-E	427	2	36.5	15.73
	527			
E-18-264	407	2	5.1	23.56
	408			
F-18-264	504	2	5.1	25.56
	505			
A1-18-266	413	2	50.0	57.70
	415			
B-18-266	416	1	24.8	42.00
X19-7	529	6		.16
E-19-200	499	1	1.5	7.38
F-19-357	418	1	6.0	12.20
G-19-357	488	1	5.5	12.52
19-415-B	428	3	4.1	7.50
	430			
	434			
19-458-CC	419	2	5.3	7.38
19-458-P	422	2	14.0	9.38
19-458-X	430	1	5.5	8.05
19-473-F	453	3	8.3	15.87
	454			
	508			
19-473-M	498	1		18.03
19-473-P	519	1		13.50
19-474-EE	504	2	13.3	12.30
	521			
19-474-F	502	1	9.0	15.06
19-474-FF	501	1	19.0	12.55
19-474-MM	493	1	19.3	13.98
D-19-516	433	1	4.0	4.14
19-601-AA	483	1	15.3	18.40
19-601-BB	483	1	26.5	16.55
19-601-CC	407	1		13.70
19-601-D	407	2	30.5	20.00
	418			
19-601-P	480	1	14.0	13.36
19-601-U	451	1	16.0	16.14

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
19-601-Y	404	1	14.0	12.78
B-19-689	492	5	11.0	9.81
	497			
	501			
	505			
E-19-708W	407	2	24.0	24.36
Q-19-746	486	1	101.8	24.75
A-19-792	418	1	4.0	5.45
B-19-792	418	1	11.5	8.18
A-19-799	432	1	4.0	5.33
B-19-799	432	1	5.0	6.05
C-19-799	432	1	6.2	5.93
D-19-799	432	1	7.8	5.82
E-19-799	432	1	9.5	7.00
F-19-799	432	1	11.5	7.38
G-19-799	432	1	13.8	9.08
J-19-799	432	1		7.60
K-19-799	432	1		7.75
B-19-804	502	4	4.8	11.43
	506			
	519			
	522			
D-19-807W	473	1	28.0	34.65
F-19-831W	485	1	12.0	13.43
G-19-833W	431	1	4.0	8.55
C-19-838W	408	1	6.5	12.08
D-19-841	487	1	18.0	26.80
A-19-847	485	1	17.9	22.00
B-19-847W	492	1	25.3	26.50
A-19-851W	521	1	17.0	18.52
B-19-851W	497	1	35.5	26.50
A-19-857W	450	1	82.5	46.71
D-19-857W	452	1		30.35
E-19-857W	446	1	18.5	22.74
A-19-858W	463	1	7.5	22.85
A-19-859W	506	1	30.0	21.25
C-19-859W	507	1	13.8	18.53
X20-23	529	2		.51
X21-39	529	4		.21
X31-9	529	2		.19
X32-10	528	8		.01
	529			
X33-12	529	2		.24
X33-61	529	2		.27
X34-8	528	8		.04
X35-5	528	2		.16
X37-16	529	6		.03
X37-59	528	2		.34
F-38-144	477	4	.1	.05
X38-5	529	8		.02
X39-8	528	12		.06
A-46-20	443	1	1.8	.86
AC-46-20	443	1	.1	.05
AE-46-20	443	1	.1	.06
AN-46-20	443	3	3.4	5.75
	474			
	480			
AP-46-20	443	3	.3	1.20
	474			
	480			
AS-46-20	443	1	3.5	2.40
AV-46-20	443	1	7.5	1.00
AW-46-20	443	2	3.0	1.28
B-46-20	443	1	1.3	.42
BB-46-20	443	1	.3	.16
BF-46-20	443	1	—	.40
EE-46-20	443	1	1.0	.42
F-46-20	443	1	6.0	3.70
J-46-20	443	1	3.0	.82
M-46-20	443	1	.1	.06
MM-46-20	443	1	2.0	1.62
N-46-20	443	1	1.0	.30
P-46-20	443	1	1.0	.63
U-46-20	443	1	.1	.07
WW-46-20	443	1	2.3	1.04
B-46-36	411	2	.2	.42
B-46-63	456	1	1.3	.75
B1-46-87	418	3	1.2	.80
	430			
	461			
C-46-149	499	1		.66

Part No.	Page	No. Req.	Lbs. Each	Unit Price
C-46-151	442	1		1.20
	495			
D-46-154	470	4	.1	.08
	514			
	527			
B-46-155	523	2	.5	.48
B-46-208	530	32	.3	.18
C-46-208	530	16	.4	.12
D-46-208	530	32	.1	.08
E-46-230	503	2	15.0	12.64
M-46-230	420	4	26.4	8.68
	421			
	422			
A-46-233	420	12	6.3	3.42
	421			
	422			
	503			
A-46-239	489	2	29.0	8.04
J-46-250	523	52	4.8	.58
A-46-277	443	1	5.0	3.00
G-62-33	442	3	.2	.39
	470			
	514			
100-LIG	529	2		4.56
111E	409	2	16.2	3.85
125H	526	1	26.0	7.50
136	407	11	3.0	1.38
	416			
	448			
	507			
	508			
	519			
	520			
X160-34	528	1		32.00
175	421	2	4.3	2.16
183	419	16	1.4	.78
	492			
	497			
	521			
	523			
	527			
CN188*	483		.7	.32
397A	519	2	20.8	5.58
617	424	20	2.1	.72
740	428	3	20.4	1.45
	522			
747	423	6	1.3	.61
	500			
759	424	20	1.8	.42
760	423	26	.4	.11
	424			
	500			
821	408	38	8.0	1.50
	416			
	450			
	451			
	452			
	454			
	473			
	492			
	493			
	497			
	498			
	499			
	501			
	504			
	505			
	506			
	507			
	508			
	521			
	527			
A-821-10	486	2	107.0	47.50
	487			
B-821-10	488	8	3.0	1.94
AA-821-12	489	2	3.0	1.55
BB-821-12	489	2	2.4	1.13
CC-821-12W	489	1	60.0	27.02
DD-821-12W	488	1	62.0	27.02
G-821-12W	489	2	13.8	4.49
K-821-12W	489	4	2.3	.79

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
N-831-131	471	2	8.5	2.86
O-831-131	471	4	1.5	.18
P-831-131	471	6	1.3	.15
Q-831-131	471	2	12.3	1.55
S-831-131	471	4	.8	.08
T-831-131	471	6	.5	.06
D-831-159W	470	1	19.5	4.68
S-831-159	470	2	4.5	.61
	513			
V-831-159W	441	6	1.3	1.19
	470			
	513			
X-831-159	470	1	18.3	5.20
BB-831-161	531	6	.3	.74
EE-831-161W	531	6	6.0	1.53
F-831-161W	531	6	26.3	13.21
J-831-161W	531	6	14.0	7.61
N-831-161W	531	6	6.0	1.42
Q-831-161W	531	6	5.0	2.95
AA-831-176W	467	1	4.5	3.33
D-831-176W	467	1	11.3	2.90
J-831-176W	467	1	8.5	2.56
P-831-176W	467	1	14.5	3.22
T-831-176W	467	1	8.5	2.23
W-831-176W	467	1	2.0	.63
Y-831-176W	467	1	2.0	1.17
D-831-177R	467	4	2.3	2.38
	511			
G-831-177W	467	2	1.0	.45
J-831-177W	467	1	2.5	.59
K-831-177	467	4	.4	.06
O-831-177W	467	1	2.0	1.71
T-831-177	467	4	.3	.06
V-831-177W	467	1	4.5	1.42
D-831-181W	468	1		4.99
F-831-181	468	1		.94
H-831-181W	468	1	4.3	2.18
M-831-181W	468	1	25.3	4.43
A-831-189W	469	1	2.3	.59
F-831-189W	469	1	1.8	2.50
J-831-189W	469	1	8.5	2.54
K-831-189	469	1		1.15
Q-831-189W	468	1	10.5	3.30
S-831-189	468	2	1.8	.26
U-831-189W	469	1	1.8	1.40
A-831-190	468	1	4.1	1.53
B-831-190	468	1	1.8	1.06
C-831-190	468	1	9.4	1.33
H-831-191	477	1	3.3	.72
A-831-193	461	2	1.0	.19
B-831-193	461	2	.8	.16
C-831-193	461	1	1.3	.18
E-831-193	461	1	1.3	.16
F-831-193	461	1	1.0	.14
J-831-193W	461	1	1.3	1.34
A-831-198	475	2	21.0	2.94
B-831-198	475	2	58.0	7.44
	476			
E-831-198	475	2	.8	.95
K-831-198	475	2	10.5	1.44
A-831-203	465	1	5.8	6.44
B-831-203	465	1	3.1	3.49
C-831-203	460	1		.10
A-831-207	476	1	.8	.41
G-831-207W	476	1	60.0	12.76
K-831-207W	476	2	1.3	.74
N-831-207W	476	2	14.0	3.08
Q-831-207W	476	1	6.8	1.69
A-831-223	525	2	1.1	.39
F-831-223W	522	1	8.0	2.21
G-831-223	525	1	9.8	1.80
J-831-223W	522	1	7.8	1.96
K-831-223	523	1	21.0	1.90
831-224-C	523	1	83.9	27.85
A-831-224	525	1	7.0	1.73
D-831-224W	522	1	27.3	6.39
A-831-225	521	1	30.8	4.61
J-831-225W	519	1	3.3	1.82
A-831-226	519	1	34.5	8.48
B-831-226	520	1	31.0	7.38
A-831-232W	523	2	99.0	61.50
D-831-234W	527	1	27.3	6.77

Part No.	Page	No. Req.	Lbs. Each	Unit Price
E-831-234	526	1	2.8	1.22
BB-831-235W	527	1	1.8	.99
P-831-235W	526	1	51.0	25.25
S-831-235W	527	1	1.1	1.44
U-831-235	527	1	.3	.29
V-831-235W	527	1	.3	.81
Y-831-235W	527	1	1.3	1.22
E-833-105W	477	1		3.42
G-833-105	477	1		.27
H-834-69W	491	2	3.0	5.10
	472			
A-840-11W	413	2	4.0	3.62
	414			
A1-840-12	411	2	102.8	27.81
	414			
C-840-12	413	6	.7	.07
	414			
D-840-12	413	6	.3	.07
	414			
A-840-24	416	2	76.0	9.90
E-840-24W	416	1	47.0	21.98
A-840-70	409	1	12.5	2.68
C-840-70W	409	1	3.0	1.60
E-840-70W	409	1	4.0	2.00
CC-840-75W	410	1	5.5	.88
D-840-75W	411	1	26.5	5.40
DD-840-75	411	2	1.5	.40
EE-840-75	411	1	1.5	.41
F-840-75W	411	2	2.5	1.06
FF-840-75	411	2	1.5	.43
N-840-75W	411	1	30.0	9.00
S-840-75W	411	1	13.0	4.21
V-840-75W	410	1	10.0	4.00
X-840-75W	410	1	3.0	2.41
Z-840-75	411	1	14.0	2.61
A-840-94W	435	1	23.5	12.20
F-840-94W	436	1	12.8	13.86
K-840-109W	441	1	1.5	.90
A-841-11	416	1	39.0	8.35
A1-841-12	407	1	49.0	14.65
A1-841-14	408	1	16.0	2.75
A-841-15	430	1	9.0	1.75
A-841-26	421	2	13.8	2.30
	422			
B-841-26W	421	3	5.5	2.74
	422			
E-841-26	426	6	.8	.34
A-841-27	421	1	11.9	1.20
B-841-27	426	1	1.5	2.48
D-841-27	426	2	1.5	.45
A-841-28W	424	3	11.5	5.98
D-841-28	424	3	2.5	.38
A-841-35	420	1	11.5	1.26
A-841-37W	434	1	11.4	11.39
B-841-50W	425	6	1.0	.86
A-841-73W	440	2	1.4	1.35
E-841-73W	440	1	15.5	2.97
A-841-75W	418	1	5.5	2.02
H-841-75W	418	1	2.5	2.21
A-841-76W	440	1	8.5	2.21
F-841-77W	440	1	8.3	4.45
N-841-77W	439	1	5.3	2.75
P-841-77W	439	2	1.3	1.50
T-841-77W	440	1	3.5	1.77
A-841-78W	440	1	9.0	2.59
A-841-79W	440	1	5.0	2.18
AA-841-79W	438	1	2.5	.79
F-841-79W	439	1	6.0	2.59
J-841-79W	440	1	3.0	2.18
U-841-79	438	1	.1	.38
B-841-80W	434	1	6.8	2.61
A-841-81W	440	7	8.8	2.14
C-841-81	439	1	4.7	3.31
A-841-84	438	1	1.3	.34
A-841-91W	432	1	6.3	2.27
A-841-92	431	1	1.0	.90
C-841-93	426	2	1.8	2.63
E-841-93	426	1	.3	.72
A-841-125W	430	1	4.0	1.62
F-841-125	430	1	1.5	.48
A-841-131W	441	1	1.0	.68
A-841-158	426	2	1.8	2.65

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
K-841-158	426	1	.5	1.08
A-841-180W	439	1	5.5	2.07
E-841-180W	439	1	1.3	1.35
H-841-180W	439	1	1.8	1.98
M-841-180W	438	1	2.5	1.46
O-841-180W	438	1	2.5	1.46
Q-841-180	438	1	18.0	3.80
A-841-181	419	1	14.4	2.45
A-841-201W	427	1	19.5	4.60
F-841-201W	427	1	19.5	4.60
J-841-201W	428	1	7.8	2.97
M-841-201W	427	2	5.3	1.22
B-841-202	427	1	4.5	2.83
C-841-202	427	1	.9	.54
F-841-202W	428	1	40.5	11.02
A-841-203W	442	1	6.4	2.48
E-841-203W	442	1	2.8	1.96
G-841-203W	442	1	7.0	2.23
J-841-203	442	1	1.8	1.22
K-841-203	442	1	9.9	3.56
N-841-203W	442	2	2.3	2.03
Q-841-203	442	1	4.5	.92
H-841-206W	428	1	9.0	2.20
N-841-206W	428	1	6.0	2.39
Q-841-206W	428	1	2.5	1.80
G-848-107	409	1	.3	.05
868A	453	9	3.6	1.08
	454			
	509			
	524			
	527			
CC-879-240A	465	1		1.37
897	530	6	4.9	3.75
992C	427	2	2.3	.92
1306	420	4	.5	.54
	503			
1307	420	4	1.9	.42
	503			
1308	420	2	2.4	2.64
1312	408	5	3.1	1.80
	521			
	527			
1312A	408	5	3.2	1.80
	521			
	527			
1383E	470	4	4.0	1.95
	514			
1462A	457	8	4.0	1.68
	458			
1462D	457	8	3.9	1.68
	458			
1663A	409	1	19.2	5.09
1744A	427	1	1.0	.60
2273A	503	1	7.4	9.45
2273B	421	2	6.5	11.90
	422			
2274A	503	1	7.0	8.77
2274B	422	2	6.4	11.90
2419A	452	12	6.8	4.56
	454			
	498			
	499			
	507			
	508			
2419B	451	2	6.5	9.15
2419C	411	2	6.3	5.83
	414			
2421	524	4	1.4	.70
2427	416	5	2.2	7.08
	448			
	473			
	492			
	521			
2438	463	1	1.9	8.10
2438A	408	1	1.8	7.41
2569B	523	4	24.0	9.18
2726	503	2	2.9	1.80
2806	419	2	3.9	2.16
2830A	486	1	28.3	25.55
2864	416	1	4.4	17.10
2864A	492	1	4.8	19.86
2864B	448	1	4.8	19.86

Part No.	Page	No. Req.	Lbs. Each	Unit Price
2864E	473	3	5.3	19.41
	497			
	521			
2991A	456	1	16.0	8.73
3104	413	2	16.3	6.45
	415			
3105	413	2	7.9	3.80
	415			
3331	419	2	2.4	2.58
3341	419	2	2.3	1.56
3366A	520	2	11.5	4.68
3383A	498	4	8.6	4.74
	499			
3436	530	7	17.5	9.96
3436B	530	1	17.5	9.96
3438	530	7	10.8	8.80
3438B	530	1	10.8	8.80
3442	452	4	30.1	10.62
	454			
	507			
	508			
3459	485	1	19.3	8.25
3459A	407	2	20.5	9.36
3459B	418	1	21.8	9.36
3567	473	13	5.3	3.18
	492			
	493			
	497			
	501			
	504			
3600	413	2	18.0	12.48
	414			
3613	519	4	36.0	13.10
	520			
3701	413	2	13.4	4.51
	414			
3634	448	1	—	28.28
3702	413	2	5.8	7.84
	414			
3703	413	7	9.0	4.78
	414			
3704	413	7	9.0	4.78
	414			
3705	416	5	8.0	9.70
	448			
3706	458	4	30.0	10.74
3707	459	2	1.2	10.52
3720	529	4		1.20
3759	488	1	306.0	292.00
3760	487	1	700.0	220.00
3761	488	8	5.3	3.41
3780	528	2		2.00
3782	528	2		2.00
10706B	528	6		.14
10707B	528	6		.14
12247B	528	6		.27
12248B	528	6		.27
15513	528	2		1.28
15514	529	2		16.80
15524	529	1		16.80
15525	529	1		16.80
15527	528	2		.03
15643	528	2		.35
201499	533	1	—	.15
201500	533	1	—	.15
201708	533	1	—	1.69
205053	533	7	—	.19
205102	533	1	—	.23
205267	533	2	—	.90
205730	533	3	—	1.13
205824	533	1	—	.19
205829	533	1	—	.23
215310	533	1	—	.75
215605	533	2	—	9.15
215660	533	1	—	8.70
215672	533	1	—	.68
215771	533	1	—	2.67
217097	533	1	—	2.40
217525	533	2	—	.30
217690	533	2	—	.30
220165	533	3	—	2.36
220353	533	1	—	36.40

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Lbs. Each	Unit Price
220636	533	3	—	.60
220745	533	1	—	1.96
221022	533	2	—	12.00
221078	533	1	—	1.95
AX-L1-A1	528	1	260.5	79.00
BE-DR-C1	404	2		1.96
BE-PY-B1	448	1	—	6.30
BE-PY-C1	448	1	—	2.52
BL-RC-D1	460	1	465.0	287.64
BR-AH-B4	486	2	75.8	37.13
	487			
BR-AH-B5	487	2	75.8	37.13
	488			
BR-D-D1	407	1		13.62
BR-D-D2	407	1		13.62
BR-D-E1	483	1	22.0	17.75
BR-D-E2	485	1	22.0	17.75
BR-F-O1	430	5	4.2	5.85
	433			
	463			
BR-F-V1	431	1		3.90
BR-SC-A1	461	2	.5	.33
BU-AE-A1	443	1	18.3	25.00
BU-HA-F1	465	1		65.00
EL-CA-F1	536	1	—	9.25
EL-CB-A1	536	2	—	1.04
EL-LA-E1	534	1	—	2.67
EL-LA-E1-1	534	1	—	.98
EL-LA-E1-2	534	1	—	.98
EL-LA-E1-3	534	1	—	.40
EL-LA-E1-4	534	1	—	.21
EL-LA-E2	536	1	—	2.67
EL-LA-E2-1	536	1	—	.98
EL-LA-E2-2	536	1	—	.98
EL-LA-E2-3	536	1	—	.40
EL-LA-E2-4	536	1	—	.21
EL-LA-F1	536	2	—	1.20
EL-LA-F2	536	2	—	1.20
EL-LA-G1	536	2	—	.15
EL-LA-G2	536	2	—	.75
EL-SO-C1	534	2	—	2.37
EL-SO-C1-1	534	2	—	1.73
EL-SO-C1-2	534	2	—	.35
EL-SW-C1	536	1	—	.90
EN-L-A11	404	3	800.0	394.00
	446			
	480			
FA-CL-A1	461	1	452.0	162.00
HJ-BL-A1	443	1	—	11.85

Part No.	Page	No. Req.	Lbs. Each	Unit Price
HO-PD-E4	443	1	1.0	1.95
LM-BE-A1	533	—	—	.04 per ft.
LM-BE-A2	533	—	—	.05 per ft.
PA-PD-A1	477	1	.3	1.65
PF-GC-A1	461	1		.68
PF-PG-B1	461	1		5.16
PF-RV-C1	465	1		11.61
PF-ST-A1	434	1	22.0	15.00
PL-DR-B1	430	1	6.5	4.02
PL-PY-A1	460	1	21.3	11.46
PL-PY-B1	461	1	6.9	4.90
PL-PY-C1	463	1	15.0	7.44
PL-PY-C2	463	1	23.0	13.26
PL-PY-D1	429	1	4.5	3.36
PN-PD-A1	534	3	46.0	23.00
PU-AM-A1	429	1	59.5	48.60
PU-K-E1	431	1	40.0	101.00
PU-VK-C	433	1	132.8	64.08
RE-KD-A1	536	4	—	.63
RE-KD-A2	536	4	—	.58
RE-PD-A1	459		1.0	.05
	404			
SR-L-A1	446	3	160.0	132.00
	480			
TA-AE-A1	443	1	83.0	40.00
TH-EA-A1	477	1		30.78
TH-TA-A	443	1	2.9	16.28
T1-G-S1	528	14	72.5	39.70
	534			
TU-G-S1	528	14		5.97
	534			
TUB-BE-A1	533	—	—	.14 per ft.
TUB-BE-A2	533	—	—	.23 per ft.
UJ-BW-A1	450	1	13.2	26.53
VA-HA-C1	465	1	4.2	17.00
WA-TC-A1	534	3	—	601.14
WH-PD-A1	528	14	58.0	7.44
	534			
WM-BM-A1	434	1	5.2	68.00
ADDENDA				
D-6-29W	523	2	1.0	1.74
D-10-211W	527	1	1.1	1.43
DP-17-9	456	2		.06
B-17-82	524	2		.24
A-17-84	524	2	.6	.60

ACCESSORY SECTION

Operation, Maintenance and Parts Lists of All Accessories Including Engine

CONTENTS

Common to 821, 831 and 841

ACCESSORIES FOR 841 MIXER ONLY

Page	Description	Barber-Greene Number	Manufacturers' Number	Manufacturers' Name
633	Viking Transfer Pump	PU-VK-C	ELQ	Viking Pump Co. Cedar Falls, Iowa
637	Kinney Metering Pump	PU-K-E1	SD-312	Kinney Mfg. Co. Jamaica Plains, Mass.
643	Water Pump	PU-AM-A1	2"x6½"-U	American Well Works Aurora, Ill.
645	Water Meter	WM-BM-A1	FV	Buffalo Meter Co. Buffalo, N. Y.
649	Pressure Tank	TA-AE-A1	20 Gal.	Aeroil Burner Co., Inc. West New York, N.J.
651	Torch Burner	BU-AE-A1	13BG	Aeroil Burner Co., Inc. West New York, N.J.
652	Hydraulic Jack	HJ-BL-A1	CB-10.5-C	Blackhawk Mfg. Co. Milwaukee, Wis.

REDUCER AND CLUTCH

LE ROI GROUP #2G13-33-11

BARBER-GREENE SPECIFICATION # SR-L-A1

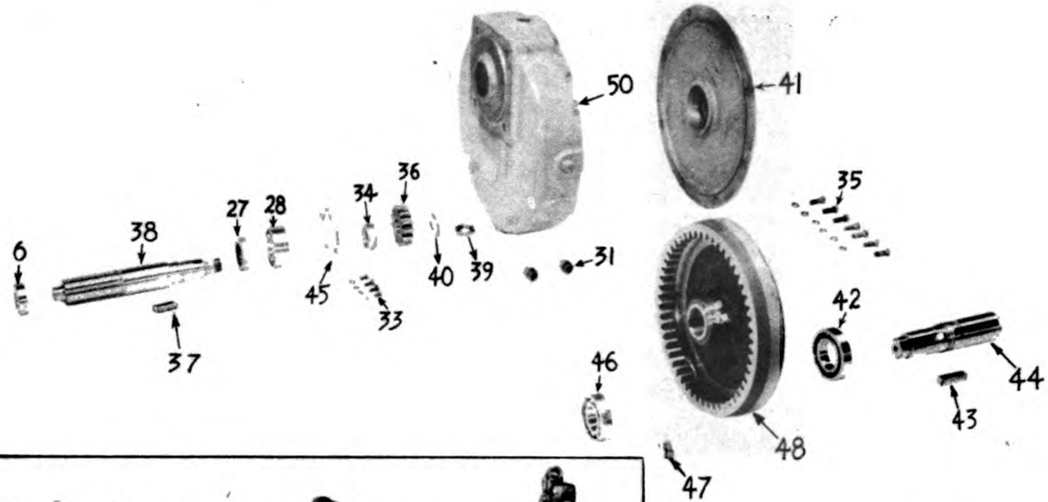


FIGURE 200

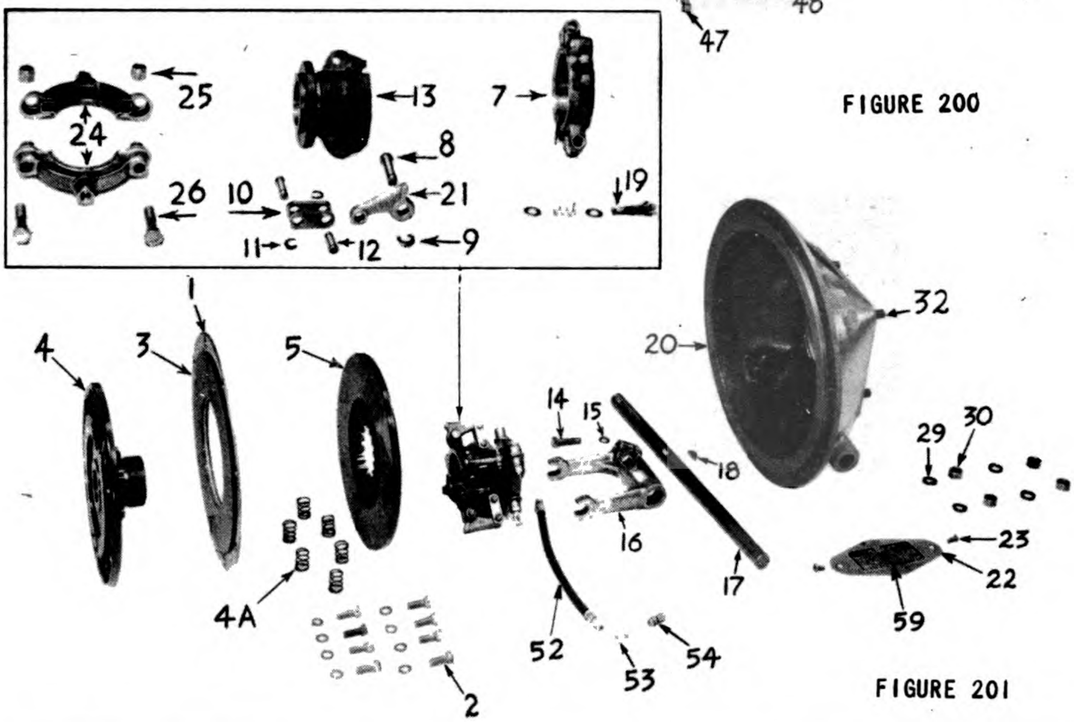


FIGURE 201

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	0116-B-10	Driving Plate Assembly
1.	1	116-B-10	Driving Plate
2.	8	34-178	Clutch Bolts
	8	05-51	Lockwasher, 3/8"
3.	2	112-B-10	Friction disc
	12	M-115	Tubular Rivet 9/64" x 3/8"
4.	1	5747	Hub and Back Plate
4a.	6	A-1069	Release Spring
5.	1	5752	Floating Plate
6.	1	181-37	Pilot Bearing Norma #205P
7.	1	1990	Adjusting Yoke
8.	4	106-A	Finger Pins
9.	4	M-641	Snap Rings

Reducer and Clutch (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
10.	8	119-B-2	Lever Links
11.	8	M-642	Snap Rings
12.	8	1968A	Lever Link Pins
13.	1	2137	Sliding Sleeve
14.	1	02-38	Capscrew, 3/8" - 16 x 1-1/2" Hex
15.	1	05-51	Lockwasher, 3/8"
16.	1	45-9	Clutch Throwout Yoke
17.	1	27-59	Clutch Yoke Shaft
18.	1	09-15	#A Woodruff Key
19.	1	2245	Adjusting Lock Pin
	1	115	Adjusting Lock Pin Spring
20.	1	37-13	Clutch Housing
21.	4	103-F	Finger Lever (Set of 4)
22.	1	14-36	Hand Hole Cover
23.	2	03-620	Screws For Cover, 1/4" - 20 x 5/8" R.H.
24.	1	117-C-8-S	Cone Collar
25.	2	M-645	Nut
26.	2	M-649	Bolt
27.	1	125-6	Rawhide Retainer
28.	1	181-48	Ball Bearing, N.D. #5207
29.	4	05-53	Lockwasher, 1/2" (for Clutch Housing Stud)
30.	4	04-605	Nut, 1/2"
31.	2	19-84	Pipe Plug, 1/2" (Magnetic)
32.	4	105-16	Clutch Housing Stud, 1/2" - 13 x 1-11/16"
33.	4	106-3	Bearing Retainer Sq. Hd. C.S., 1/4" - 20 x 1/2"
	4	05-49	Lockwasher, 1/4"
34.	1	66-9	Spacer
35.	8	02-36	Transmission Body Cover Capscrews, 3/8" - 16 x 1" Hex
	8	05-51	Lockwasher, 3/8"
36.	1	26-21	Pinion Gear, 8 Teeth
37.	1	91-4	Key, 1/4" x 1/2" x 13/16"
38.	1	27-1208	Clutch Drive Shaft
39.	1	53-193	Clutch Drive Shaft Nut
40.	1	20-47	Clutch Drive Shaft Washer
41.	1	14-37-2	Transmission Body Cover
42.	1	181-61	Ball Bearing, Norma #209
43.	1	09-172	Key, 1/2" x 1/2" x 2"
44.	1	27-812	Final Drive Shaft
45.	1	31-14	Ball Bearing Retainer
46.	1	118-113	Ball Bearing, Norma #207
47.	1	106-41	Set Screw, 3/8" - 16 x 1-1/4"
	1	61-5	Locking Wire
48.	1	26-20	Internal Ring Gear
49.	1	16-94	Transmission Body Cover Gasket
50.	1	13-33-11	Transmission Body
51.	12	02-36	Clutch Housing Cap Screw, 3/8 - 16 x 1" Hex
	12	05-51	Lockwasher, 3/8"
52.	1	A73-252-1	Weatherhead Hose
53.	1	182-52	Inverted Male Elbow
54.	1		1/8" Hydraulic Alemite, Male Button Hd.
55.	1	62-5	Oil level Name Plate
56.	1	02-36	Cap Screw (For Oil Level Name Plate)
57.	1	62-57-1	Gear Ratio Plate
58.	2	017-1	Oil Cups #0 x 1/4" Dia.
59.	1	62-75	Clutch Instruction Plate
60.	4	012-1	Escutcheon Pins, #14 x 3/16" long

Reducer and Clutch (Continued)

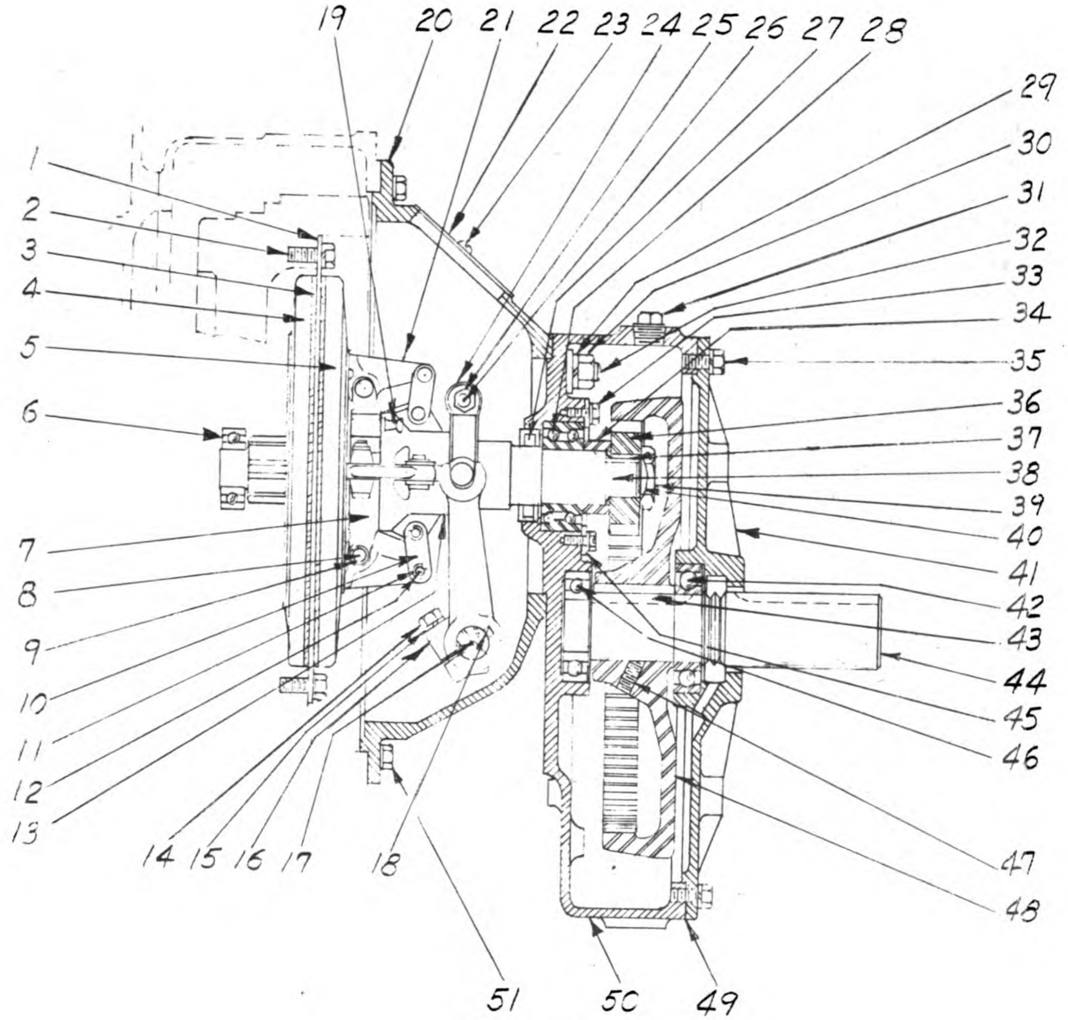


FIGURE 202

SPECIFICATIONS

Clutch - Model CS-110 No. X5738 Twin Disc

Reducer - Ratio 3.92 to 1, Group No. 2G13-33-11 Le Roi

PRINCIPLE

This unit consists of a totally enclosed single spur gear speed reducer mounted on a clutch housing which fits the engine bell housing. The gear pinion on the high speed clutch shaft drives the internal teeth on the large gear mounted on the slow speed power take-off shaft.

The clutch is a single dry plate type, mounted on the high speed reducer shaft, within the clutch housing, having its friction drive plate bolted to the engine flywheel.

Reducer and Clutch (Continued)

OPERATION AND ADJUSTMENT

If the clutch does not pull, heats, or operating lever jumps out, adjustment is necessary.

Remove hand hole plate (22) on the clutch housing and turn the clutch until the adjusting lock pin (19) can be reached. Caution: Be sure that the engine is not running. Pull the lock pin out and turn adjusting yoke (7) one notch to the right, allowing the lock pin to drop into the notch. One notch is usually sufficient to adjust this clutch. A new clutch requires more frequent adjustment until the friction discs (3) are worn in.

MAINTENANCE

Removal and dismantling of this unit may be accomplished as follows:

(A) Remove cap screws (51) which hold clutch housing (20) to the engine and the reducer may be removed from the engine. The clutch will remain attached to the engine flywheel.

(B) Remove clutch bolts (2) and the clutch may be removed from the engine flywheel.

Cone collar (24) is held to sliding sleeve (13) by two bolts (26). This collar should turn freely on the sleeve, but should not be too loose. Sleeve (13) is coupled to the clutch by lever links (10) with pins (12) and snap rings (11) to finger levers (21) which are held to adjusting yoke (7) by pins (8) with snap rings (9). Adjusting yoke (7) with lock pin (19) is threaded on hub of back plate (4) and may be readily removed.

With adjusting yoke removed, floating plate (5) and driving plate (1) with friction discs (3) can be taken off the back plate.

New facings may be installed by removing old from driving plate and riveting new in place.

(C) Reducer unit may be disassembled by taking out cap screws (35) and removing cover (41) shaft (44) with internal ring gear (48) which is keyed and set screwed to the shaft. Use care not to damage gasket (49).

Reducer housing (50) is held to clutch housing (20) by studs (32).

Remove nut (39) washer (40) and pinion gear (36) with key (37) and spacer (34) may be removed. Clutch shaft (38) may now be withdrawn in the direction of its splined end.

Bearing (28) is held in place by retainer (45) with cap screws (33).

TOWING PINTLE

U.S. ARMY TYPE HOOK #C57093-X

HOLLAND HITCH CO. ASSEMBLY #110

BARBER-GREENE SPECIFICATION #PN-PD-A1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
111.	1	O-6837-V	Forged hook
112.	1	C-55100	Pintle Lock
113.	1	B-12694	Pintle Latch (dog)

Towing Pintle (Continued)

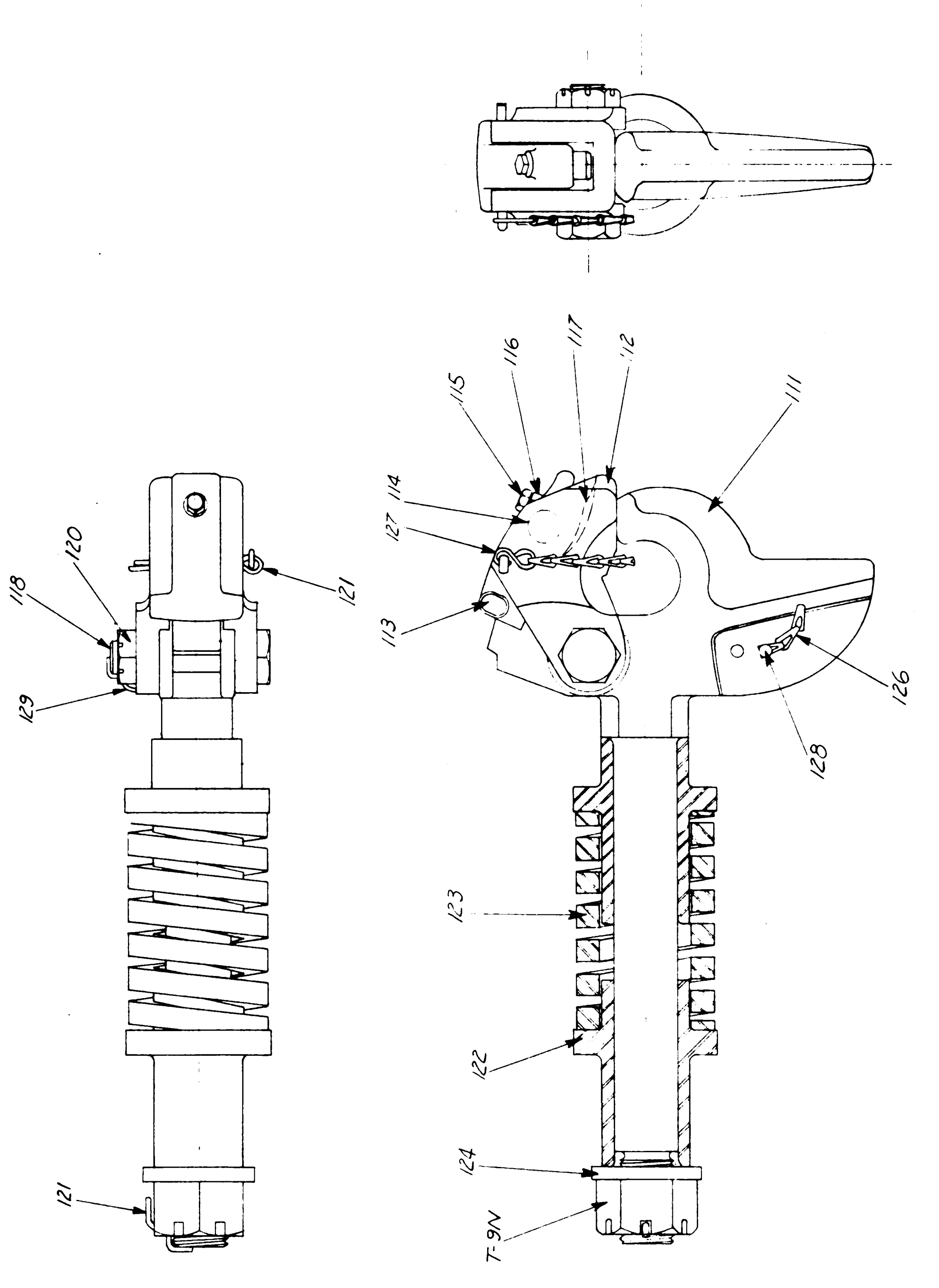


FIGURE 203

Towing Pintle (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
114.	1	A-5865	Pin, 7/8" x 2-1/2"
115.	1	BCBX1BD	Cap Screw, 5/16" x 1-1/4"
116.	1	B-5282-B	Lock Washer, 5/16"
117.	1	A-5862	Latch Spring
118.	1	A-135441	Bolt, 1" x 3-7/8"
129.	1		Cotter, 1/8" x 1-1/2"
120.	1	A-5864	Jam Nut, 1"
121.	2	BFAX2CF	Cotter Key, 1/4" x 3"
122.	2	O-6838-V	Sleeve
123.	1	A-135834	Spring, 2-3/8" I.D. x 7-1/4"
124.	1	A-135835	Washer, (plain) 1-9/16" x 3" x 3/8"
T-9N	1	BBGX3C	Nut (comp. spr.)
126.	1	PN-PD-A1-126	Chain 16 Links
127.	1	PN-PD-A1-127	S-Link
128.	1	PN-PD-A1-128	Drive Screw 10"x 1/2" Type U

BRAKE FILTER

BENDIX WESTINGHOUSE #221022 TYPE E

FROM BARBER GREENE SPECIFICATION #BK-BE-B1

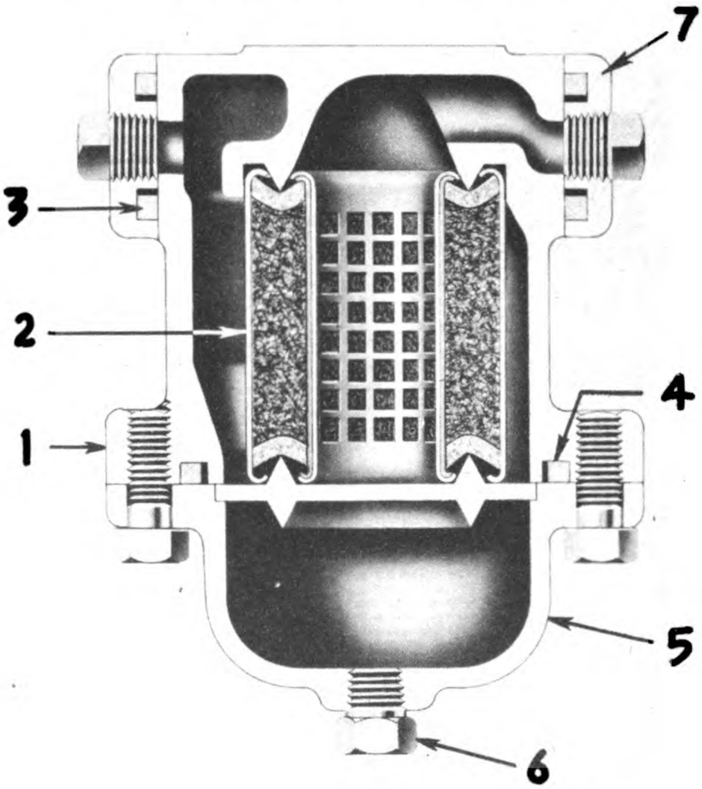


FIGURE 204

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	214169	Body
2.	1	221053	Strainer
3.	2	214174	Flange Gasket
4.	1	214173	Body Gasket
5.	1	214172	Dirt Chamber
6.	1	21[illegible]30	Pipe Plug
7.	2	214134	Flange

Brake Filter (Continued)

SPECIFICATION:

Bendix-Westinghouse. #221022 Type E

DESCRIPTION

This unit consists of a body, with intake and outlet ports, a replaceable strainer, and a dust chamber.

MAINTENANCE

Little attention is required other than cleaning of dust chamber and replacement of strainer.

Remove cap screws holding dirt chamber (5) to body (1) to clean dust chamber or replace strainer element (2). Use care not to damage gasket (4).

RELAY EMERGENCY VALVE

BENDIX WESTINGHOUSE #220353

FROM BARBER GREENE SPECIFICATION # BK-BE-B1

(WITH SPECIAL DIAPHRAGM COVER)

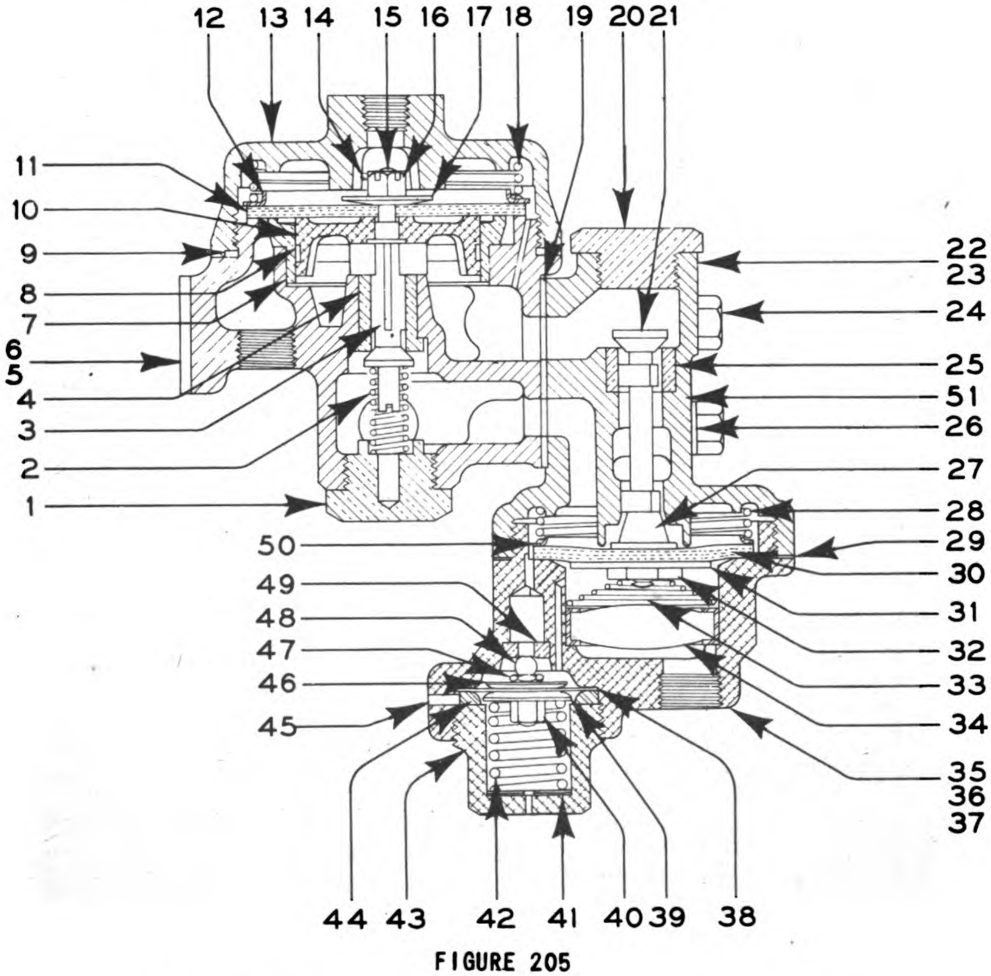


FIGURE 205

Relay Emergency Valve (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	202692	Cap Nut
2.	1	202699	Spring
3.	1	202693	Intake Valve
4.	1	202690	Valve Seat
5.	1	216071	Body Complete Includes items 4, 6, & 7 Item #7 cannot be replaced in the field
6.	1	204568	Body
7.	1	212135	Diaphragm Guide Bushing
8.	1	202869	Diaphragm Guide Ring
9.	1	211367	Cover Gasket
10.	1	204650	Diaphragm Guide
11.	1	202695	Diaphragm
12.	1	202697	Spring Seat
13.	1	202691	Cover
14.	1	203016	Cotter Pin
15.	1	204651	Diaphragm Screw
16.	1	203227	Diaphragm Nut
17.	1	202696	Diaphragm Washer
18.	1	202698	Spring
19.	1	202735	Gasket
20.	1	202741	Cap Nut
21.	1	203379	Valve Stem
22.	1	215204	Emergency Assembly - Includes items 23 & 25
23.	1	202746	Emergency Valve Body
24.	4	203388	Hex Head Bolt
25.	1	202736	Valve Seat
26.	4	202982	Lock Washer
27.	1	202743	Diaphragm Support
28.	1	202738	Spring
29.	1	202747	Cover Gasket
30.	1	202744	Diaphragm (Emergency)
31.	1	213387	Washer
32.	1	200029	Lock Nut
33.	1	204056	Spring
34.	1	204055	Strainer
35.	1	220305	Diaphragm Cover Assembly - Includes items 36 through 49
36.	1	220304	Diaphragm Cover Complete - Includes items 37, 45, and 49
37.	1	213225	Diaphragm Cover Body
38.	1	213227	Diaphragm
39.	1	211541	Lower Diaphragm Follower
40.	1	211542	Stem Lock Nut
41.	1	213229	Shim
42.	1	213228	Spring
43.	1	213230	Cap
44.	1	213226	Ring
45.	1	213224	Pin
46.	1	211595	Upper Diaphragm Follower
47.	1	211538	Stem
48.	1	211539	Ball
49.	1	211537	Seat
50.	1	202737	Upper Spring Seat
51.	1	220829	Emergency Valve Assembly - Includes items 20 through 50

Relay Emergency Valve (Continued)

The Relay-Emergency Valve serves two purposes: It speeds up brake action on the trailer, and it provides a means of applying the brakes automatically in case of trailer breakaway.

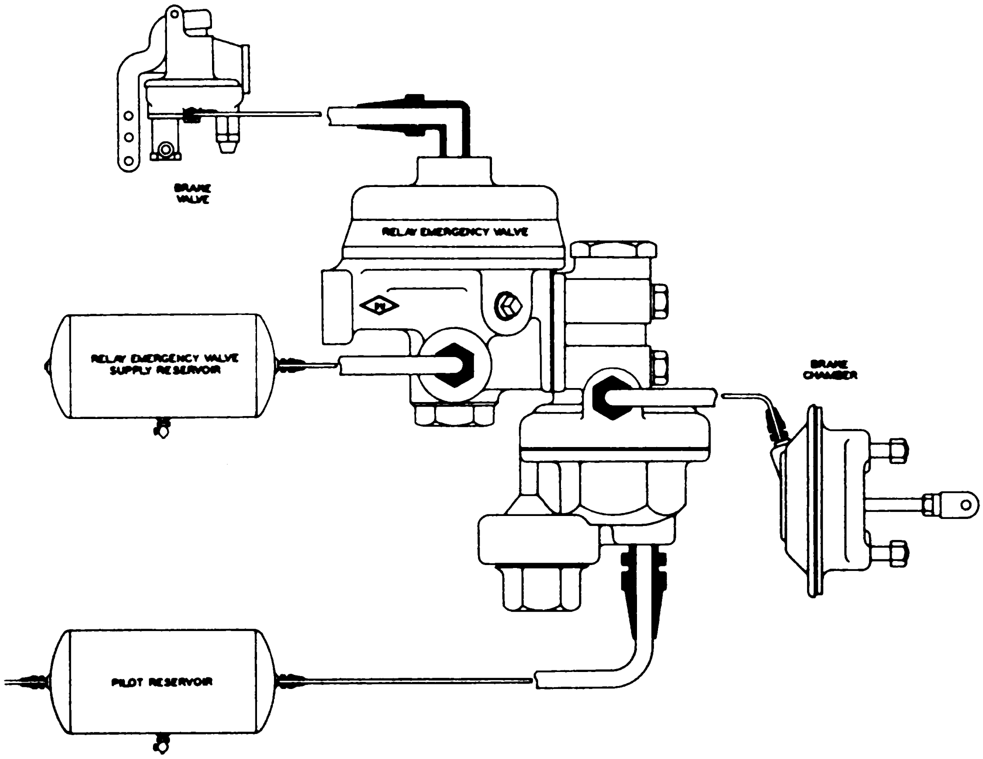


FIGURE 206

The correct method of installing tubing or hose lines to the Relay-Emergency Valve is shown in Figure 206. Of the four pipe taps in the relay portion of the Relay-Emergency Valve, one of the lower ports is used for connecting the relay-emergency valve supply reservoir and the other three should be closed with pipe plugs. The exhaust port should never be closed. In shipping, the Relay-Emergency Valve has a pipe plug or thread protector in the exhaust port to prevent dirt getting into the valve while in transit. This plug or thread protector must be removed when the valve is placed in service.

OPERATION

The Relay-Emergency Valve operation falls into two classifications: the normal operation and the emergency operation. The normal operation is actuated by the driver and the regular action of the Air Brake System. The emergency operation is induced by anything (such as trailer breakaway) that would cause a sudden and abnormal drop of air pressure in the pilot reservoir.

The following paragraphs and pictures describe the valve movements necessary to attain each of the various operations illustrated by Figures 207, 208 and 209. Figure 207 shows the valve in the normal or full release position. Figure 208 shows the valve in full application position. Figure 209 shows the valve in full emergency position. By observing these figures in conjunction with the following descriptions, it is possible to obtain a complete picture of the valve's operation.

Relay Emergency Valve (Continued)

Normal Position and Building Up of Air Pressure in Supply Reservoir

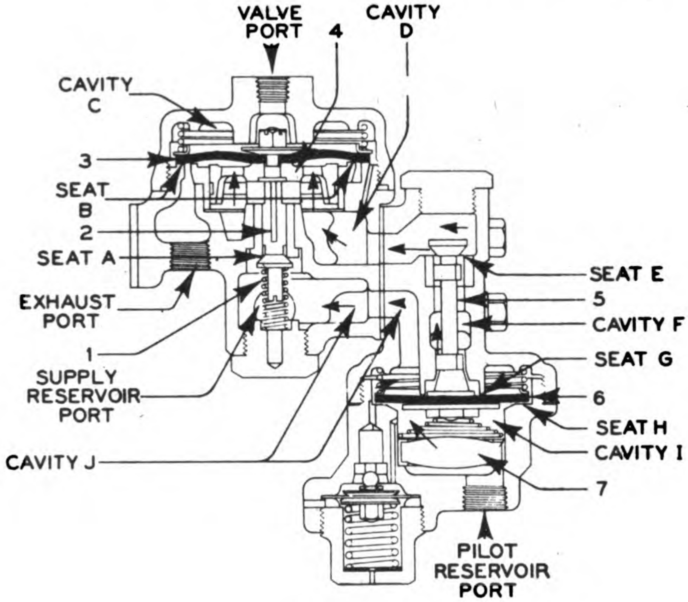


FIGURE 207

The air pressure built up in cavity I by the pilot reservoir holds the edges of diaphragm 6 above seat H, permitting the air pressure from the pilot reservoir and cavity I to pass into cavity J and out through a tubing line to the relay-emergency valve supply reservoir. By this method, full pilot reservoir pressure is constantly maintained in the supply reservoir and cavity J. The air pressure in cavity I also forces the center of diaphragm 6 up against seat G, sealing the lower end of cavity F against the air pressure held in cavity J. As the diaphragm is held sealed against seat G emergency valve 5, connected to the diaphragm, is held up off seat E so that a direct connection is established between cavity D and the brake chambers which are connected into cavity F.

NORMAL APPLICATION

When in regular brake application the driver depresses the brake pedal, the brake valve will deliver air pressure into cavity C where, due to the Relay-Emergency Valve's self-lapping feature, it causes the Relay-Emergency Valve to deliver to the brake chamber the same amount of air pressure applied by the brake valve. The air pressure entering cavity C forces diaphragm 3 down against seat B, closing off the exhaust port. The deflection of the diaphragm 3 also causes diaphragm guide 4, connected to the diaphragm, to contact supply valve 2 and move it away from seat A.

As the supply valve is opend the air pressure which has been restrained in cavity J is permitted to pass up into cavities D and F and out through tubing lines to the brake chambers. Supply valve 2 is held open until the air pressure in the brake chambers and cavity D has been built up to equal the pressure applied above the diaphragm by the brake valve, then the valve automatically laps itself. This means that air pressure in cavity D is strong enough to balance the pressure in cavity C and raise diaphragm 3 and diaphragm guide 4 sufficiently to permit spring 1 to close supply valve 2, but not enough to open the exhaust port. This self-lapped position holding the air pressure in cavity D and brake chambers constant, is maintained until brake valve pressure in cavity C is either increased or decreased. If the brake valve pressure is increased, the performance is repeated until a higher

Relay Emergency Valve (Continued)

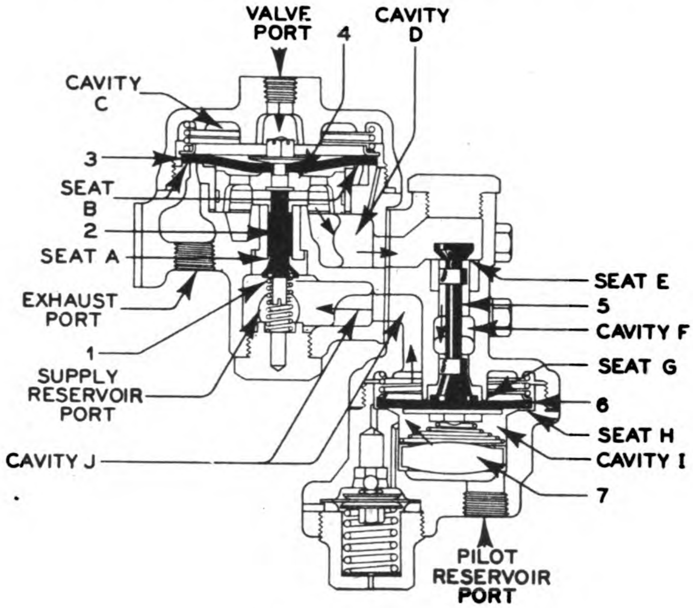


FIGURE 208

balance pressure is attained. If the brake valve pressure is decreased, pressure in cavity D is strong enough to lift the diaphragm off points B, permitting the air pressure to exhaust to atmosphere through the exhaust port until a lower balance pressure is attained. If all the brake valve pressure is released, the exhaust port is held open until all the air pressure is exhausted from the brake chamber and cavity D.

Emergency Application

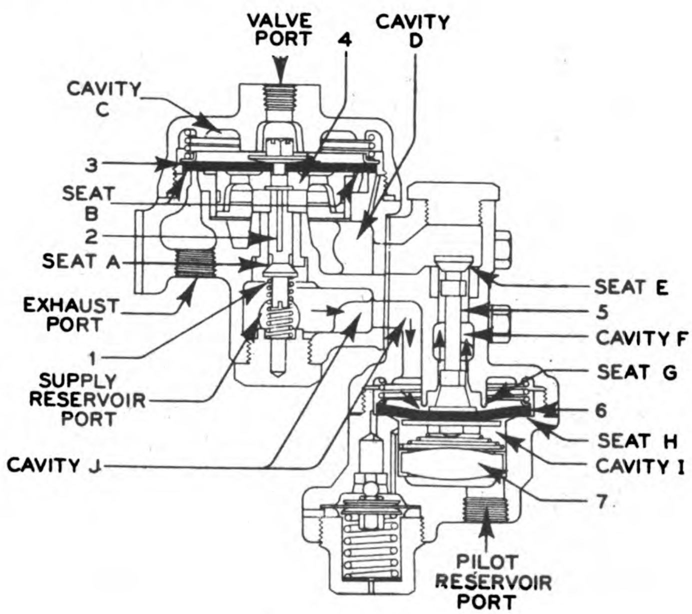


FIGURE 209

Relay Emergency Valve (Continued)

The emergency application occurs only in case an accident (such as trailer breakaway) should cause a sudden and abnormal drop of pressure in the line between the pilot reservoir and the Relay-Emergency Valve.

This sudden drop of air pressure in cavity I causes the pressure that has been built up in the supply reservoir and cavity J to force diaphragm 6 down against seat H, so that the air pressure in cavity J cannot escape through cavity I. The downward movement of the diaphragm causes emergency valve 5, connected to diaphragm 6, to move down against seat E, closing the upper end of cavity F so that no pressure can escape through cavity D to the exhaust port. The downward movement also pulls the diaphragm away from points G, opening the lower end of cavity F and permitting air pressure from the supply reservoir and cavity J to pass directly through cavity F to the brake chambers.

On the valve there is a pressure regulating valve built into the emergency valve cap which allows the trailer reservoir to feed back into the tractor reservoir until the pressure in the trailer reservoir equals approximately 70 lbs. to 80 lbs. per square inch, then shuts off and when the trailer reservoir continues to drop a brake application will occur on the trailer when the pressure in the tractor reservoir has reduced to approximately 45 lbs. to 50 lbs. per square inch. But in cases of a sudden drop in the emergency line, such as a broken line between the tractor reservoir and the relay emergency valve, an emergency brake application will occur on the trailer.

It is very important that this equipment be tested daily and is well maintained to insure the performance for which the equipment is designed.

Releasing Brakes After Emergency Application

Two methods may be used to release the brakes after an emergency application has occurred. The recommended method is to repair and reconnect the air brakes so that all connection lines and equipment are in their original condition and then to operate the compressor to build up air pressure. As the air pressure in cavity I is built up to equal the pressure in cavities F and J, it presses up diaphragm 6 so that the valve resumes its normal operating position. In this position the diaphragm pressing against points G seals the lower end of cavity F against the air pressure in cavity J. Likewise, emergency valve 5 is held up off seat E opening the upper end of cavity F into cavity D, so that the air pressure in cavity F and the brake chambers is released through cavity D and the exhaust port to atmosphere. The other method is to drain the air pressure from the relay-emergency valve supply reservoir.

Length of Emergency Application

The length of time that the brakes will maintain an emergency application depends upon the care the equipment has been given. Without proper maintenance, the valve and various connections may be leaking freely and the emergency application time will be comparatively short. However, if the equipment has been carefully maintained, with all connections properly sealed against leakage and the emergency valve leakage held to the minimum, the emergency application will be held for a much longer time.

INSPECTION

The Relay-Emergency Valve should be inspected and tested each time before put into use. The following leakage tests will give an accurate check on the valve's condition. In case leakage in any one of these tests causes

Relay Emergency Valve (Continued)

a 3-inch soap bubble in 3 seconds, the entire valve should be removed and cleaned or replaced with a reconditioned unit if necessary.

Regular Leakage Tests

(1) With brakes released, cover exhaust port with soap suds. Leakage is caused by supply valve 2 not seating properly.

(2) With brakes applied, cover exhaust port with soap suds. Leakage is caused by diaphragm 3 not seating properly.

Emergency Tests

(3) Be sure there is pressure in the trailer reservoir. Disconnect emergency hose between truck and trailer; trailer brakes should apply automatically. This is the safety feature which applies the brakes automatically in case of trailer breakaway and should be tested daily to insure proper functioning of the devices in case of an emergency.

(4) Cover emergency hose or connections on trailer with soap suds. Leakage is caused by diaphragm 6 not seating properly.

(5) Cover exhaust port with soap suds. Leakage in excess of that evident in test 1 is caused by valve 5 leaking.

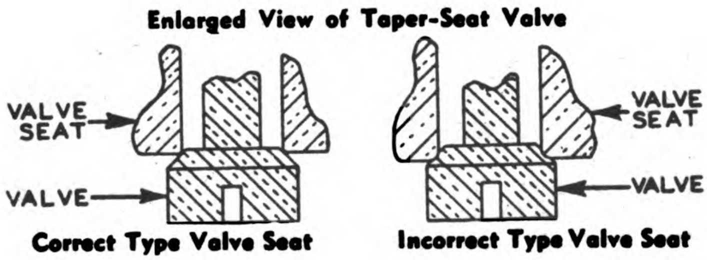
MAINTENANCE SERVICE

Three parts of the Relay-Emergency Valve require periodical maintenance service:

Strainer (7) should be removed about once every six weeks, cleaned thoroughly with gasoline, and replaced.

Diaphragms (3) and (6) should be replaced once each year; more often if operating conditions warrant.

When the Relay-Emergency Valve does not meet the inspection test leakage requirements, it will sometimes be found that the trouble is caused by dirt



Rounded Seat will not seal. When valve seat is worn, scored or pitted, a correct and efficient seal cannot be obtained.

FIGURE 210

Relay Emergency Valve (Continued)

on the valve or diaphragm seat. This condition can be remedied by removing the leaking valve or diaphragm, cleaning the valve and valve seat with kerosene, and then regrinding the valve.

If the leakage is caused by a badly worn valve, it will be necessary to replace the worn valve with a new one. In this case, generally it will be found that the valve and both diaphragms are badly worn and the operator will likely find it more economical and satisfactory to replace the entire Relay-Emergency Valve with a genuine factory-reconditioned unit.

AXLE - TRAILER ASSEMBLY

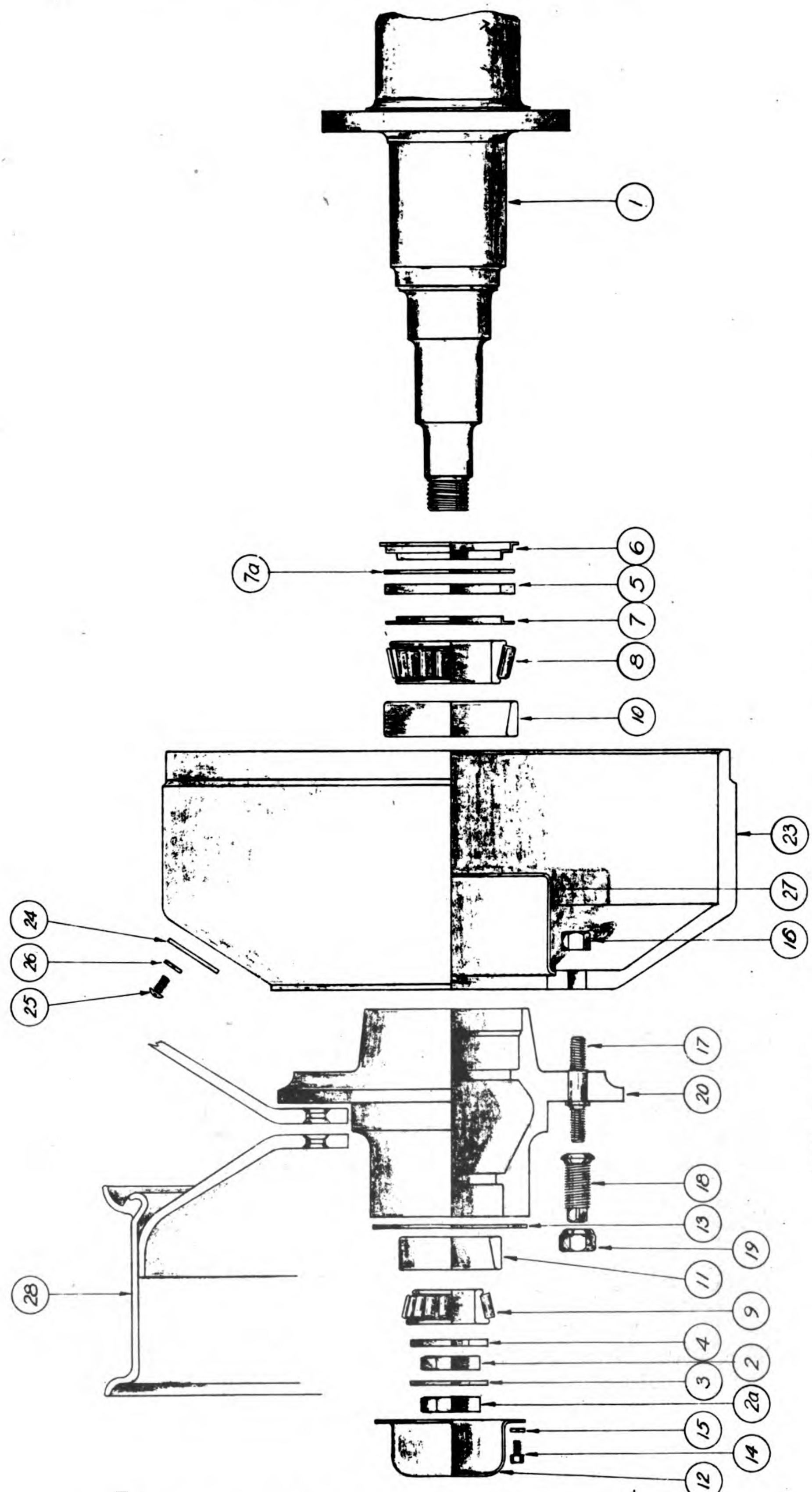
INCLUDES AXLE - SPRING AND BRAKE GROUP

BARBER-GREENE SPECIFICATION #WA-TC-A1

Axle Group

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	T-11025-N	Axle Beam (Special 76-5/8" Track)(Timken)
2.	4	1227-X-102	Wheel Bearing Nut (Timken)
3.	2	1229-T-462	Wheel Bearing Nut Lock (Timken)
4.	2	1229-J-712	Wheel Bearing Thrust Washer (Timken)
	2	T8-17-24-1	Cylinder Mounting Bracket (Timken)
	2	A-1205-M-273	Wheel Bearing Oil Seal Assembly (Timken) (Includes Items 5-6-7-7a)
5.	2	5X-267	Wheel Bearing Felt (Timken)
6.	2	1205-M-273	Wheel Bearing Felt Retainer - Inner (Timken)
7.	2	1205-N-274	Wheel Bearing Felt Retainer - Outer (Timken)
7a.	2	1205-N-274A	Wheel Bearing Felt Retainer Washer (Timken)
8.	2	560-S	Wheel Bearing Cone - Inner (Timken)
9.	2	419	Wheel Bearing Cone - Outer (Timken)
10.	2	552-A	Wheel Bearing Cup - Inner (Timken)
11.	2	414	Wheel Bearing Cup - Outer (Timken)
12.	2	3262-A-53	Hub Cap (Timken)
13.	2	2208-H-216	Hub Cap Gasket (Timken)
14.	12	X-1545	Hub Cap Screw (Timken)
15.	12	X-528	Hub Cap Screw Lock Washer (Timken)
16.	12	13X-9	Hub and Drum Stud Nut (Timken)
17.	12	20X-38	Hub and Wheel Stud - Righthand (Timken)
17.	12	20X-37	Hub and Wheel Stud - Lefthand (Timken)
18.	6	1199-J-114	Righthand Stud Cap Nut - Inner
18.	6	1199-K-115	Lefthand Stud Cap Nut - Inner
19.	6	1199-N-118	Righthand Stud Cap Nut - Outer
19.	6	1199-M-117	Lefthand Stud Cap Nut - Outer
20.	1	A2-333-V-464	Righthand Hub and Stud Assembly (Timken)
20.	1	A1-333-V-464	Lefthand Hub and Stud Assembly (Timken)
23.	2	A-3219-T-1294	Drums (Timken)
24.	2	1107-C-29	Drum Inspection Cover (Timken)
25.	2	2X-19	Drum Inspection Cover Screw (Timken)
26.	2	X-529	Drum Inspection Cover Lock Washer (Timken)
27.	2	3286-T-20	Drum Oil Slinger

Trailer Axle Assembly (Continued)



AXLE, HUB, & DRUM ASSEMBLY
9B-1-13

FIGURE 211

Trailer Axle Assembly (Continued)

Spring Group

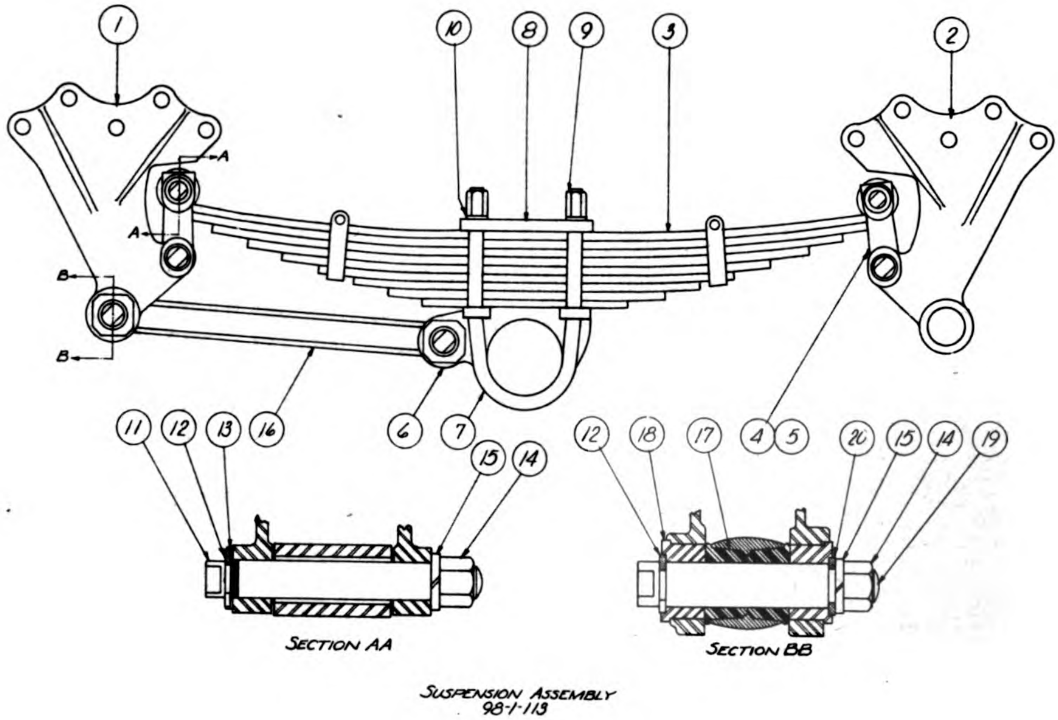


FIGURE 212

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	3-1-13	Spring Hanger
2.	2	3-1-14	Spring Hanger
3.	2	SB-9900-B	Spring
4.	4	T4-3-4-4	Spring Shackle
5.	8	S-359	Shackle Bushing
6.	2	3-5-7	Spring Seat
7.	4	3-7-14	Spring Clip
8.	2	T4-3-26-2	Spring Clip Tie Plate
9.	8	N-767-A	Spring Clip Nut
10.	8		7/8" Standard Lockwashers
11.	8	T4-3-10-4	Shackle Pin
12.	12	T4-3-57-1	Washer
13.	8	T4-3-58-1	Washer Holder
14.	12		1" SAE Hex Nut
15.	12		1" Standard Lockwasher
16.	2	T4-3-11-5	Radius Rod
17.	8	#739	Harris Bushing
18.	8	T4-3-55-1	Radius Rod Adjusting Bushing
19.	4	T4-3-13-5	Radius Rod Pin
20.	4	T4-3-56-1	Special Washer
	8		Hydraulic Grease Fitting (1/8" Buttonhead Type)

Trailer Axle Assembly (Continued)

Brake Group

Timken Detroit "P" Series Brakes

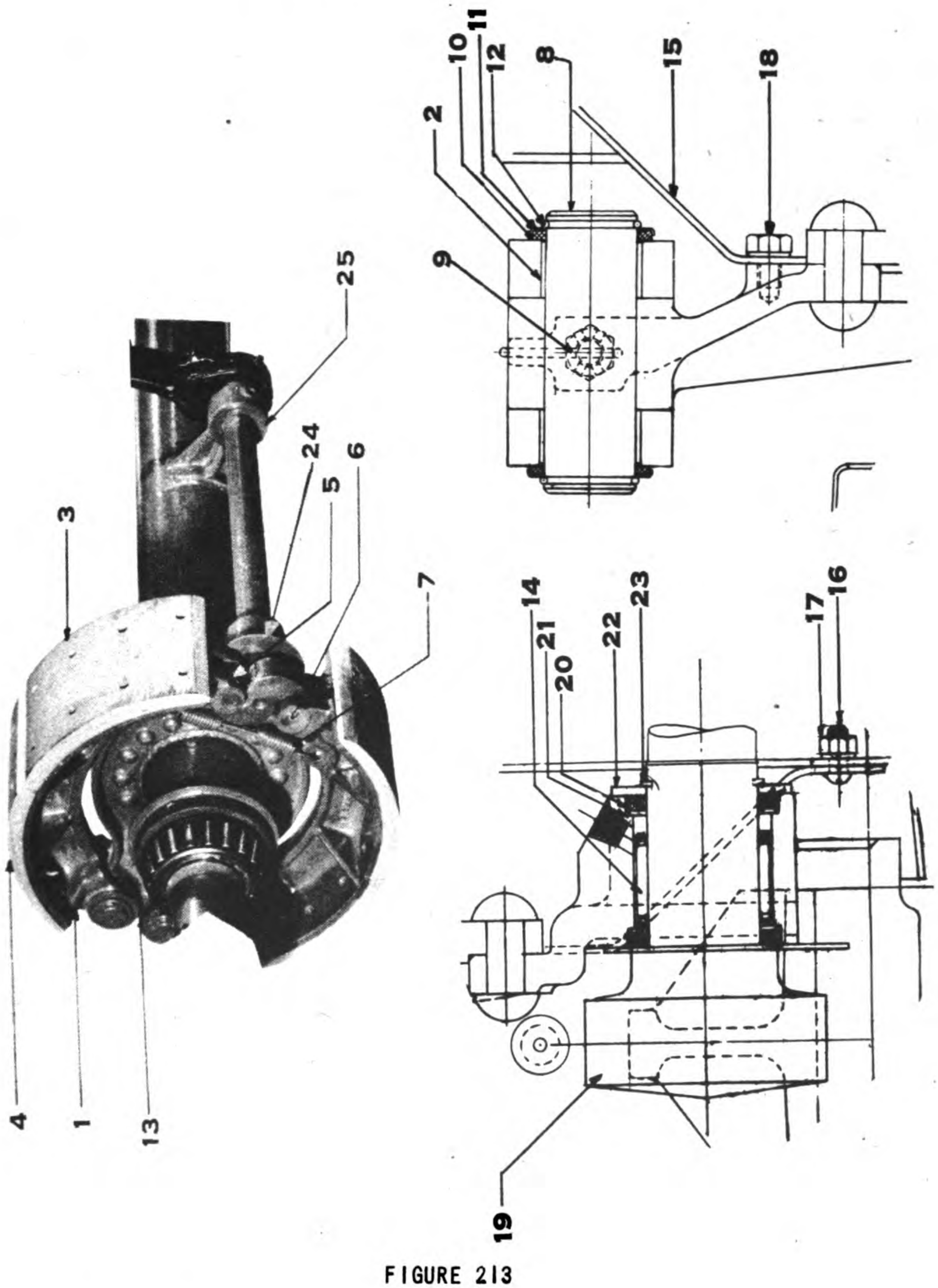


FIGURE 213

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	4	A-3222-J-400	Brake Shoe & Lining Assembly
2.	4	1225-F-266	Brake Shoe Bushing
3.	4	2240-V-906	Brake Shoe Lining (Cam End)
4.	4	2240-W-907	Brake Shoe Lining (Anchor End)
	64	17X-177	Brake Shoe Lining Rivet
5.	4	1199-A-625	Brake Shoe Roller

Trailer Axle Assembly (Continued)

Brake Group (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
6.	4	1246-S-227	Brake Shoe Roller Pin
	4	1199-B-626	Brake Shoe Roller Pin Set Screw
7.	2	2258-P-328	Brake Shoe Return Spring
8.	4	1259-L-90	Brake Shoe Anchor Pin
9.	4	2X-26	Brake Shoe Anchor Pin Lock Screw
	4	11725	Brake Shoe Anchor Pin Lock Screw Wire
10.	4	5X-180	Brake Shoe Anchor Pin Felt
11.	4	1205-K-193	Brake Shoe Anchor Pin Felt Retainer
12.	4	1218-M-13	Brake Shoe Anchor Pin Felt Retainer Spring
13.	2	A-3211-Z-832	Brake Spider & Needle Bearing Assembly
14.	2	1228-A-53	Brake Spider Needle Bearing
	48	X-1876	Brake Spider & Axle Flange Rivet
	2	X-740	Brake Spider Oil Elbow
	2	X-361	Brake Spider Oil Elbow Plug
15.	1	A1-3236-K-635	Dust Shield - Righthand Upper and Left-hand Lower
15.	1	A1-3236-L-636	Dust Shield - Lefthand Upper and Right-hand Lower
16.	4	X-1609	Dust Shield Capscrew
17.	4	X-1015	Dust Shield Capscrew Nut
	4	X-527	Dust Shield Capscrew Nut Lockwasher
18.	2	X-1815	Dust Shield & Spider Capscrew
	2	X-528	Dust Shield & Spider Capscrew Lockwasher
19.	1	WA-TC-A1-1	Brake Camshaft Short
19.	1	WA-TC-A1-2	Brake Camshaft Long
20.	2	5X-433	Brake Camshaft Felt
21.	2	1229-J-868	Brake Camshaft Felt Retainer
22.	2	1229-Q-771	Brake Camshaft Felt Retainer Washer - Thin
22.	2	1229-R-122	Brake Camshaft Felt Retainer Washer - Medium
22.	2	1229-M-559	Brake Camshaft Felt Retainer Washer - Thick
23.	2	1229-H-866	Brake Camshaft Felt Retainer Washer Lock
24.	2	1229-E-837	Brake Camshaft & Spider Washer
	2	1229-R-122	Brake Camshaft & Lever Spacing Washer
25.	2	3299-Y-493	Brake Camshaft Bracket (Welded to Axle)

BRAKE CHAMBER-BENDIX WESTINGHOUSE #217750 STUD TYPE C

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	205948	Yoke
2.	1	220001	Push Rod
3.	2	212303	Stud (Same as 210594)
4.	1	217843	Non Pressure Plate
5.	2	201318	Lockwasher (Same as 202985)
6.	16	203151	Hex Head Bolt
7.	1	201271	Diaphragm
8.	1	210812	Pressure Plate
9.	1	212550	Spring
10.	16	203145	Hex Nut (Same as 214151)
11.	16	202985	Lockwasher
12.	2	203575	Hex Nut
13.	1	203575	Hex Nut
14.	1	*214847	Washer, Scraper
15.	1	*214846	Spring

Brake Group (Continued)

NOTE: Rubber boot on push rod, as illustrated in Fig. 216 has been discontinued. Chambers so equipped can be operated without boot, if 1/8" drain hole is drilled in non-pressure plate at Point "A" Fig. 214. Parts marked * are parts supplementing boot on only chambers originally furnished without boot.

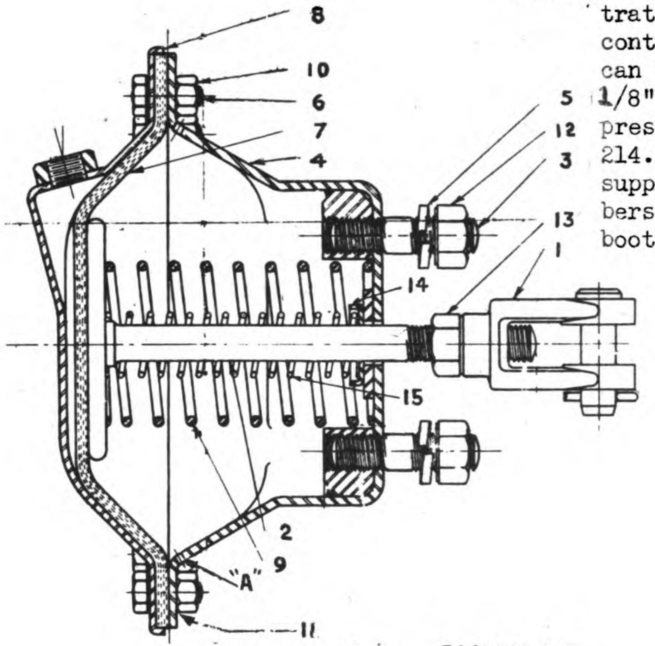


FIGURE 214

SLACK ADJUSTER BENDIX WESTINGHOUSE #220269 TYPE K

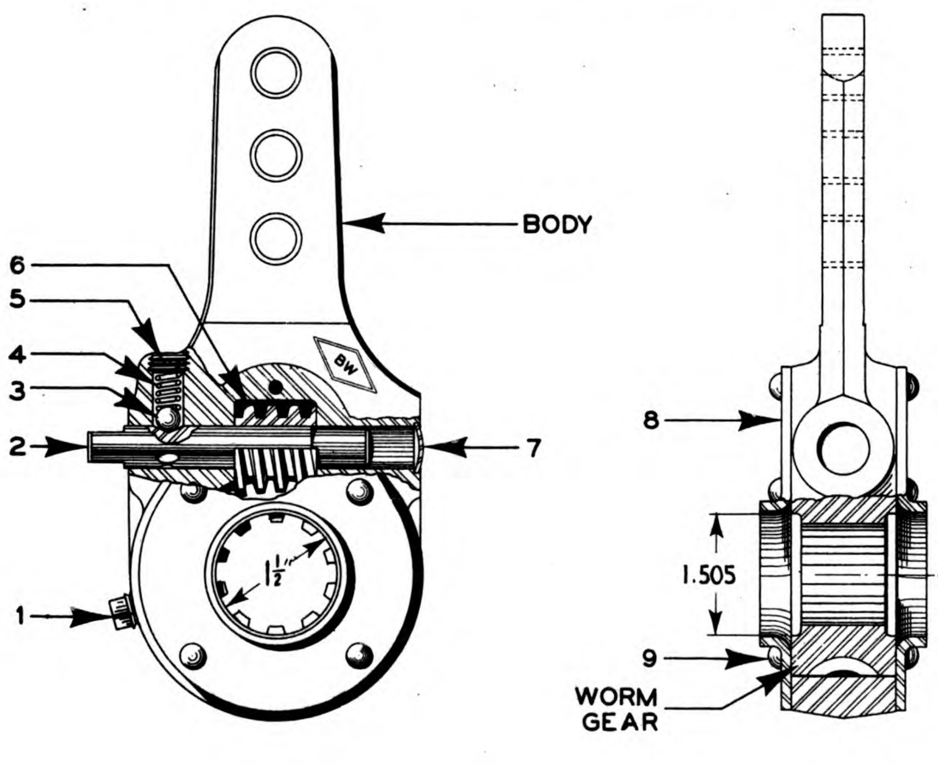


FIGURE 215

Trailer Axle Assembly (Continued)
Brake Group (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	213086	Body
	1	212629	Worm Gear
1.	1	203680	Pipe Plug
2.	1	212630	Worm Shaft
3.	1	201327	Lock Ball
4.	1	212633	Spring
5.	1	201326	Screw Plug
6.	1	212628	Worm
7.	1	212357	Welsh Plug
8.	2	212631	Cover
9.	4	212632	Rivet

SPECIFICATIONS:

Wheels - 20" Disc by 5.005 Rim (per Quarter Master Drg. No. 08407-Y)

Axle - Trailer Co. of America. Includes axle with brake cylinder bracket, wheel hubs with bearings, hub caps, wheel studs, nuts, brake drums, radius rods and springs.

Brakes - 16-1/2" x 4" Timken-Detroit Axle Co.

Brake Chamber - Bendix-Westinghouse. Stud Type "C"

Slack Adjuster - Bendix-Westinghouse. Type K

Principle and Operation - Brake Chamber

The function of the brake Chamber is to convert the energy of compressed air into the mechanical force necessary to expand the brake shoes out against the brake drums. In this operation the push rod moves the slack adjuster toward position C - applying the brakes - as the driver depresses the brake pedal, then moves the slack adjuster back to the regular position - releasing the brakes-- as the driver releases the brake pedal.

The Brake Chamber consists of two dished metal plates, namely: the non-pressure plate and the pressure plate, separated by a diaphragm made of oil-proof rubber and fabric. In front of the diaphragm are the non-pressure plate, push rod 2 and push rod spring 1. Behind the diaphragm is airtight cavity A, into which is connected a tubing line from the brake valve. When the Brake Chamber is installed, the yoke is connected directly to the slack adjuster lever arm.

As shown, spring 1 holds the push rod plate against the diaphragm so that any movement of the diaphragm is immediately transferred to the push rod. Consequently, as air pressure from the brake valve is admitted into cavity A, it forces the diaphragm and push rod forward, moving the slack adjuster toward position C, applying the brakes. When the air pressure is released from cavity A through the brake valve, the diaphragm and push rod return to their normal positions, pulling the slack adjuster back to position B, releasing the brakes.

Due to the extreme sensitivity of the diaphragm, this arrangement permits push rod 2 to respond to the slightest variation of air pressure from the brake valve, thus permitting the driver to apply or release the brake as rapidly or as gradually as the various road and operating conditions warrant.

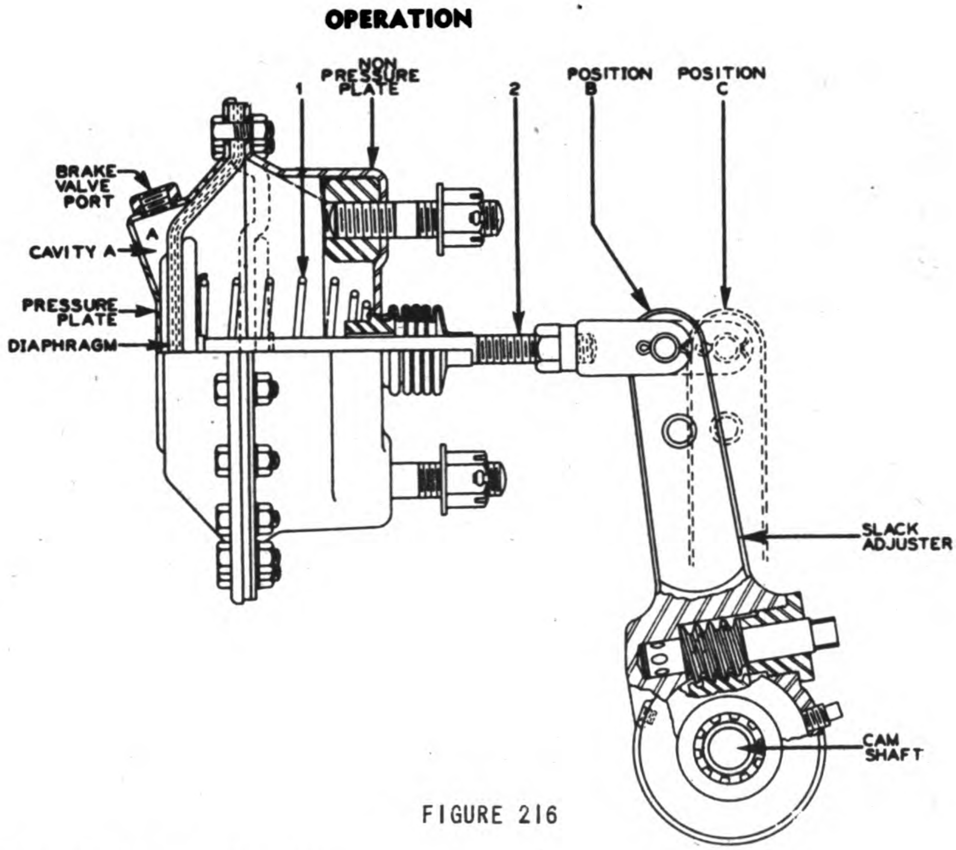


FIGURE 216

Maintenance - Brake Chamber

The following test should be made for leakage:

(1) With soap suds coat around the edges of the diaphragm and around bolt holes. No leakage is permissible. In case of leakage tighten bolts uniformly until leakage is eliminated. Do not make the bolts so tight that diaphragm is distorted.

(2) Check push rod travel by measuring the push rod with brakes released and then with brakes applied. If push rod travel is in excess of or is near to the maximum stroke of 1-3/4" adjust the brakes as per instructions under Slack Adjuster. It is essential to keep the diaphragm travel as short as possible inasmuch as excessive travel shortens the diaphragm's service life.

Only two parts of the Brake Chamber require any service. These parts are the diaphragm and the boot. The diaphragm should be replaced at least once each year, more often in hard service. The boot should be removed whenever it shows signs of cracking or breaking.

Principle and Operation - Slack Adjuster

The Slack Adjuster not only serves as a regular brake lever during normal brake applications but also provides a quick method of brake adjustment.

The Slack Adjuster spline is mounted firmly on the spline of the cam shaft and held by positive means. The brake chamber yoke is mounted to one of the holes in the lever arm.

In normal braking the entire Slack Adjuster is held rigid as a unit and rotates bodily with the cam shaft as the brakes are applied or released.

The most efficient brake action obviously will be obtained when the Slack Adjuster arm travel is held to a minimum so that full length of the lever is used. The brake adjustments necessary to maintain proper Slack Adjuster arm travel are made by turning adjusting worm 3. This rotates worm gear 2 together with cam shaft and cam, expanding the brake shoes so that the slack caused by brake lining wear is taken up and the Slack Adjuster arm travel is returned to the minimum setting. These brake adjustments usually average less then 5 minutes to wheel.

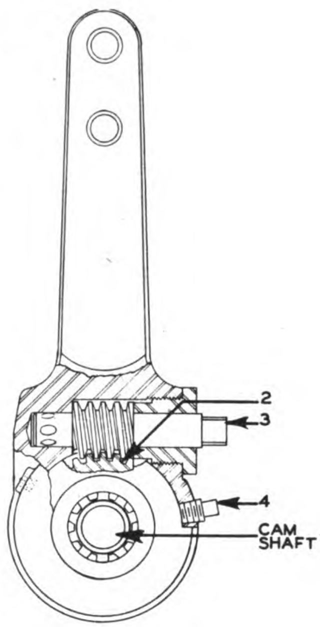


FIGURE 217

Adjustment of Slack Adjuster

The Slack Adjuster enables the mechanic to make a complete and perfect adjustment of the brakes as the vehicle stands on the highway or the service floor. A regular open-end or adjustable wrench is the only tool required to complete the operation. This permits a substantial saving of time and labor.

The following steps are suggested in brake adjustments:

(1) Build up the reservoir pressure to at least 80 pounds and maintain at least 60 pounds while brakes are being adjusted.

(2) For first adjustment on a new unit it is suggested that you jack up each wheel and turn worm 3, which rotates the cam shaft, until the brake shoes are tight against the drum.

(3) Back off on the worm until the wheel is free and check to see that there is between .008 inch and .010 clearance at the toe end of the shoe. Apply the brakes; note and record brake chamber push rod travel. This information should be used on all future adjustments.

(4) The push rod travel should be the same for both brake chambers on the axle. Adjust to 3/4" minimum push rod travel. Brakes must be adjusted if travel exceeds 1-3/4 inches.

(5) The brakes should be adjusted every 1000 miles and checked more often in very severe service. This check may be made by applying the brakes and measuring the brake chamber push rod travel. If this is more than it was on the original adjustment, the brakes should be readjusted by turning the worm, decreasing this travel to the point where it was on the original adjustment.

Operators find several advantages in keeping push rod travel down to a minimum:

(1) Short travel greatly increases the life of the brake chamber diaphragm.

(2) The air consumption with the short push rod travel is greatly reduced.

(3) Brake performance is greatly improved.

Trailer Axle Assembly (Continued)

Maintenance of Slack Adjuster

The body, worm gear and worm of the Slack Adjuster are made of heat-treated steel and are capable of meeting the most severe tests with a minimum of maintenance service.

Worm gear and worm should be kept well lubricated. This can be done by removing plug and filling the cavity with a good grade of chassis lubricant each time the vehicle is inspected.

The replaceable bronze bushings fitted into the holes in the Slack Adjuster arm should be inspected at each major vehicle inspection and replaced if necessary.

OIL VALVE

MICRO CAM HAUCK # MODEL #A-3/8"

BARBER-GREENE SPECIFICATION #VA-HA-C1

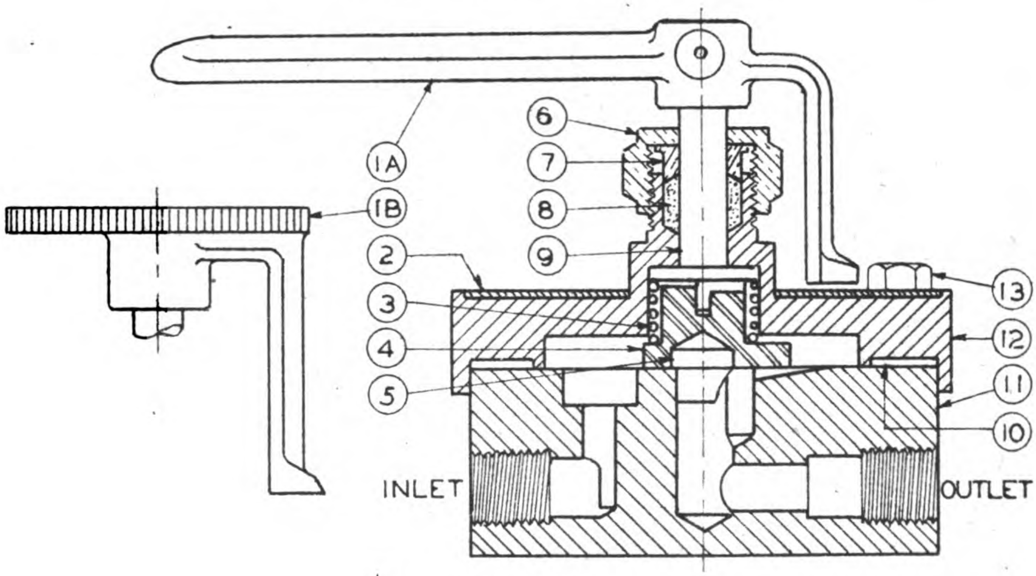


FIGURE 218

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1b.	1	VA-HA-C1-1B	Wheel Handle
2.	2	VA-HA-C1--2	Oil Control Valve Dial
3.	1	VA-HA-C1-3	Oil Control Valve Cam Spring
4.	1	VA-HA-C1-4	Oil Control Valve Cam
5.	1	VA-HA-C1-5	Oil Control Valve Cam Centering Pin
6.	1	VA-HA-C1-6	Packing Nut
7.	1	VA-HA-C1-7	Packing Sleeve
8.	1	VA-HA-C1-8	Packing
9.	1	VA-HA-C1-9	Oil Control Valve Stem
10.	1	VA-HA-C1-10	Oil Control Valve Gasket
11.	1	VA-HA-C1-11	Oil Control Valve Body
12.	1	VA-HA-C1-12	Oil Control Valve Cap
13a.	4	VA-HA-C1-13a	Body Screws "A" Size Valve (Long)
13b.	4	VA-HA-C1-13b	Body Screws "A" Size Valve (Short)

Oil Valve (Continued)

SPECIFICATION:

Hauck Model "A" - 3/8 - 10 Micro-Cam wheel type oil valve.

PRINCIPLE and OPERATION:

This valve is calibrated and constructed to permit control of fuel oil flow rate. It produces a straight-line discharge and once the flow is established on a particular job the valve may be used for metering, since each calibration on the dial has the same increment of oil flow.

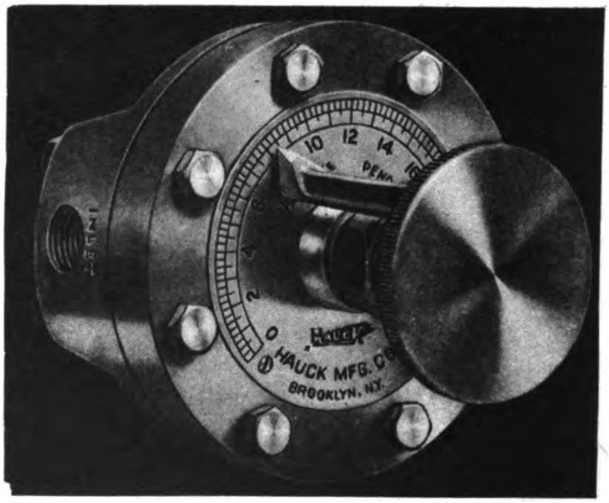


FIGURE 219

The flow of oil is governed by a cam (4) with a knife edge rotating against a V-slot in a flat plane of body (11) and working with very little bearing pressure. The cam movement over the tri-angular slot in the flat face permits any desired oil flow from minimum to maximum capacity. The cam is ground to produce a straight line discharge curve. With this straight line characteristic the flow is directly proportional to the area of the slot opening and to the number on the calibrated dial. Thus the pointer at No. 6 position always indicates a flow three times the flow at No. 2 position. With the Micro-Cam valve the flow and repeat settings are set instantly and accurately at will.

MAINTENANCE (References to repair diagram)

If valve leaks around stem (9), tighten packing nut (6). To replace packing, remove wheel (1B) packing nut (6) and packing sleeve (7).

Valve may be completely taken apart by following steps above for replacement of packing, then removing cap screws (13).

FAN

CLARAGE FAN CO. MODEL #15

BARBER-GREENE SPECIFICATION #FA-CL-A1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	FA-CL-A1-1	Housing Complete
2.	1	FA-CL-A1-2	Long Shavings Wheel
3.	1	FA-CL-A1-3	Wheel Key
4.	1	FA-CL-A1-4	Inlet Side Plate
5.	1	FA-CL-A1-5	Journal Side Plate
6.	1	FA-CL-A1-6	Cooling Fan for Inboard Bearing
7.	1	FA-CL-A1-7	Inboard Bearing Complete
8.	1	FA-CL-A1-7	Outboard Bearing Complete
9.	1	FA-CL-A1-9	Shaft 1-7/16" dia.
10.	1	FA-CL-A1-10	Bearing Support

Fan (Continued)

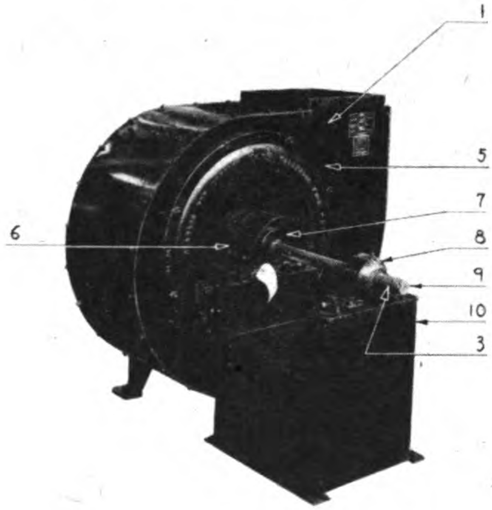


FIGURE 220

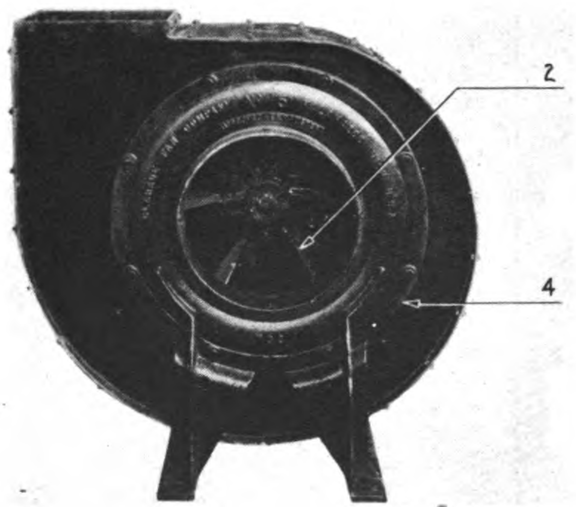


FIGURE 221

SPECIFICATIONS:

Model - Clarage No. 15 Exhauster

Wheel - Long shavings type

Arrangement - B

Bearings - Anti-friction (inboard fan cooled for 450^{o} operation)

Performance - (Normal) Approx. 2500 Cu. Ft. per minute at 938.8 r.p.m. nd 2" Static Pressure requiring 1-1/2 Brake H.P.

Rotation - Counter Clockwise

Discharge - Up blast

PRINCIPLE and OPERATION

This unit is of all steel construction consisting of fan wheel, shaft, housing, and structural mounting. It is assembled to provide an up blast discharge. The bearings are of anti-friction type, sealed against dust and grit, with the inboard bearing fan cooled for operation at temperatures up to 450°.

MAINTENANCE

This unit requires little attention other than proper lubrication of the anti-friction bearings. See lubrication chart.

The fan wheel may be readily removed by taking off the side plate which covers an opening in the housing larger than the fan diameter.

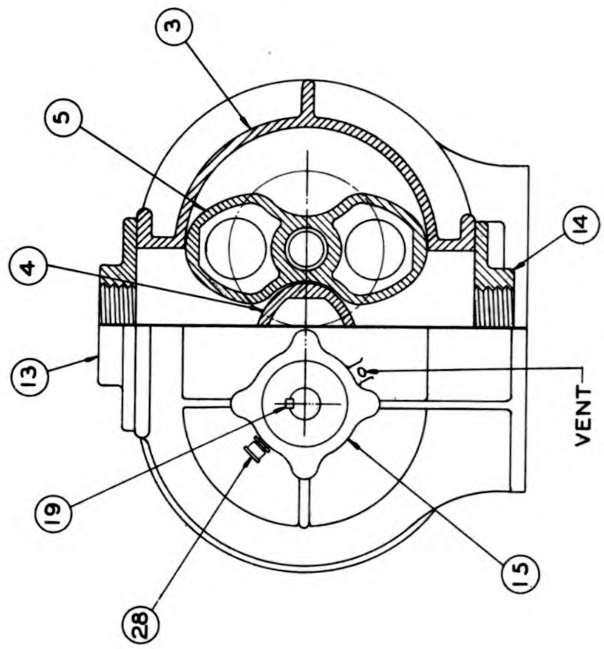
BLOWER, OIL PUMP AND RELIEF VALVE

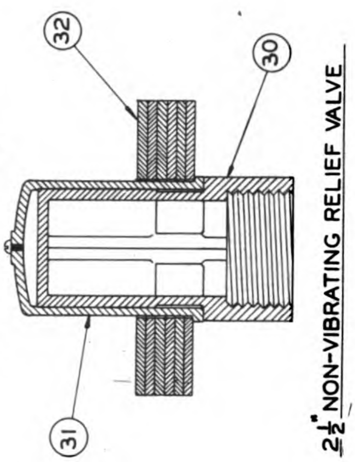
VICTOR ACME-ROOTS-CONNERSVILLE CO.
MODEL #615 AF

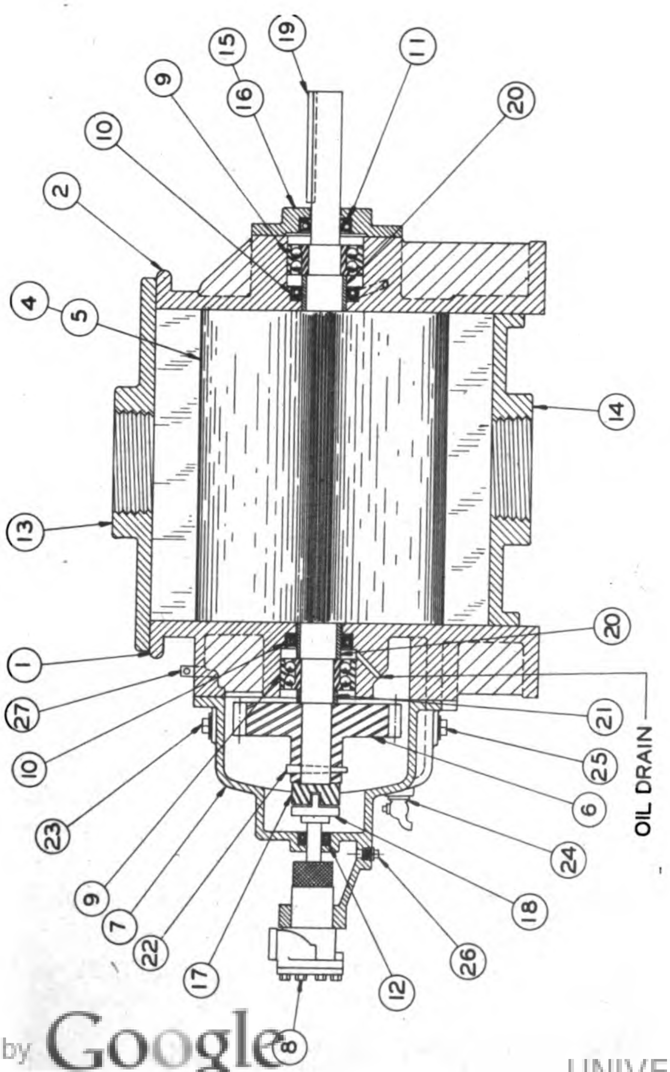
BARBER-GREENE SPECIFICATION #BL-RC-D1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	BL-RC-D1-1	Headplate (Gear End)
2.	1	BL-RC-D1-2	Headplate (Drive End)
3.	2	BL-RC-D1-3	Cylinder (Half)
4.	1	BL-RC-D1-4	Driving Shaft & Impeller
5.	1	BL-RC-D1-5	Driven Shaft & Impeller
6.	2	BL-RC-D1-6	Timing Gears (in pairs)
7.	1	BL-RC-D1-7	Gear Housing & Pump Support
8.	1	BL-RC-D1-8	Oil Pump (See details below)
9.	4	BL-RC-D1-9	Headplate Bearing
10.	4	BL-RC-D1-10	Oil Retainer (Headplate)
11.	1	BL-RC-D1-11	Oil Retainer (End Cover)
12.	1	BL-RC-D1-12	Oil Retainer (Gearhouse)
13.	1	BL-RC-D1-13	Top Pipe Plate
14.	1	BL-RC-D1-14	Bottom Pipe Plate
15.	1	BL-RC-D1-15	End Cover (Drive)
16.	1	BL-RC-D1-16	End Cover (Blind)
17.	1	BL-RC-D1-17	Driving Plate
18.	1	BL-RC-D1-18	Oil Pump Coupling
19.	1	BL-RC-D1-19	Pulley Key
20.	4	BL-RC-D1-20	Shaft Sleeve
22.	2	BL-RC-D1-22	Taper Pin
23.	1	BL-RC-D1-23	Oil Filler Plug
24.	1	BL-RC-D1-24	Oil Level Cock
25.	1	BL-RC-D1-25	Oil Drain Plug
26.	1	BL-RC-D1-26	Oil Pump Support Drain
27.	1	BL-RC-D1-27	Vent Cap
28.	2	BL-RC-D1-28	Bearing Lubricator
			Relief Valve
30.	1	BL-RC-D1-30	Valve Seat
31.	1	BL-RC-D1-31	Valve Cylinder
32.	6	BL-RC-D1-32	Weights
			Oil Pump
C-29	1	C-29	Idler Pin
C-62	1	C-62	Packing Gland Ring

Blower, Oil Pump and Relief Valve (Continued)







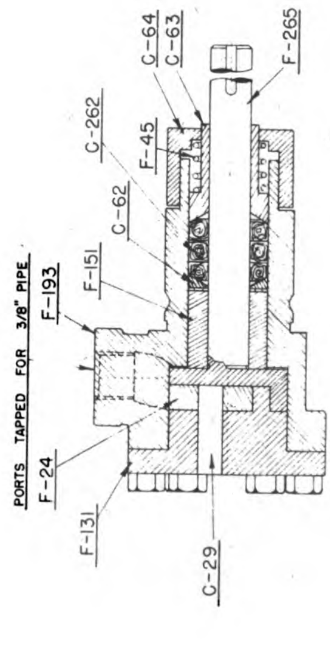


FIGURE 222

Blower, Oil Pump and Relief Valve (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
C-63	1	C-63	Packing Gland
C-64	1	C-64	Packing Nut
F-24	1	F-24	Idler
F-265	1	F-265	Rotor and Shaft
F-45	1	F-45	Seal Spring
F-131	1	F-131	Head (With R-312C Gasket)
F-151	1	F-151	Casing Bushing
F-193	1	F-193	Casing
C-262	3	C-262	Packing Ring Garlock #333 (3 per Set)
	6		Capscrews 1/4" - 28-SAE 9/16" long.

SPECIFICATIONS:

Blower - Roots-Connersville No. 615, 4" Victor-Acme, left hand, with top discharge and 2-1/2" weight type relief valve set at 2#.

Pump - 3/8" Viking EFCD-3 fuel oil pump mounted on gear housing of blower and driven by blower drive shaft.

PRINCIPLE AND OPERATION

The blower is of the positive displacement type, having two impellers mounted on parallel shafts, which rotate in opposite directions. The relation of the impellers is maintained by a pair of timing gears. As the impellers revolve, air is drawn into the space between them and the case and as the rotation continues the air is pushed out through the outlet into the air line. This action is repeated twice for each impeller revolution. The blower is equipped with a weighted pressure relief valve to maintain constant pressure.

The fuel pump is of the positive displacement type, having a rotor and idler which mesh, and with every revolution of the pump a definite amount of liquid is drawn in between the idler and rotor teeth. The liquid is forced out of the tooth spaces into the discharge port by the meshing of the teeth.

MAINTENANCE

BLOWER - Caution: In working on the drive shaft, do not use force on the end of the shaft, otherwise the impeller may be driven against the opposite head, causing binding and heating.

LUBRICATION - Note: See plates on blower. Be sure blower is properly lubricated. Grease and oil should be checked every 200 working hours. Bearings at drive end are packed with grease before shipment. Add grease as often as necessary. Use special high temperature ball bearing grease. Gear end must be supplied with oil, before starting blower. Use No. 30 SAE oil. Change oil as needed. Add oil every 200 working hours, or when necessary, until it runs out of opened pet-cock in gear house, when blower is not running. Close pet-cock after checking oil level. Do not over-lubricate. Too much oil in gear house will cause flooding and excess heating.

To Disassemble - Remove drive end headplate. (2), gear house and pump support (7), with pump 8, timing gears (6) are pinned to the end of the impeller shafts with taper pins (22). Remove gears and gear end head plate (1).

PUMP - Packing nut C-64 should be tightened in the event leakage develops at pump shaft. Replace packing when necessary.

To dismantle, remove pump support (7) and coupling (18) on blower. Remove cap screws and take off casing bushing (F-131)

LOW PRESSURE FUEL OILBURNER

HAUCK MODEL #583

BARBER-GREENE SPECIFICATION #BU-HA-F1

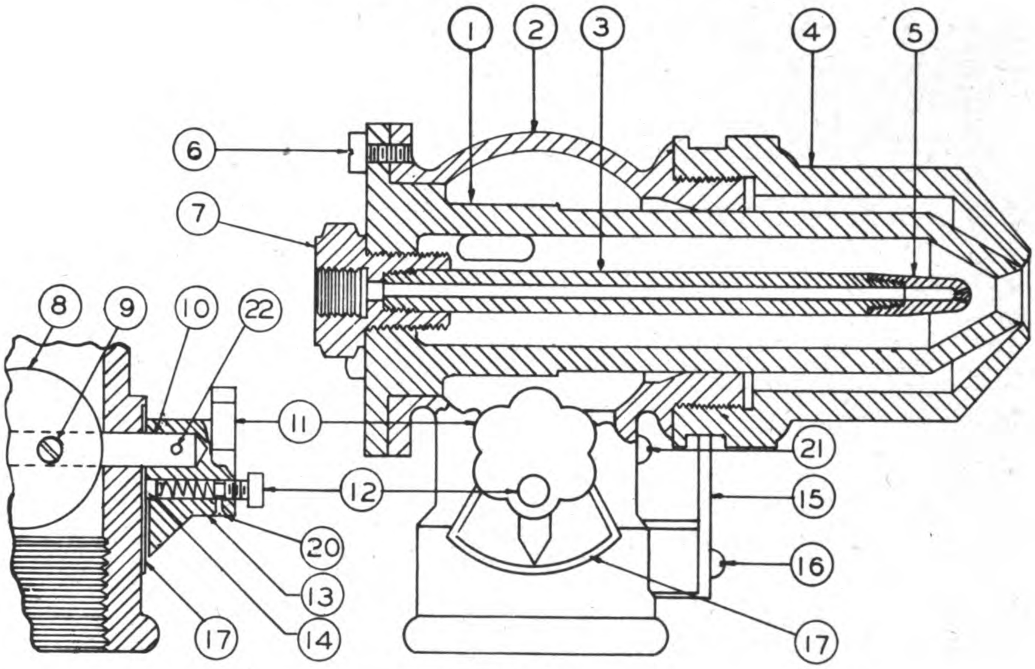


FIGURE 223

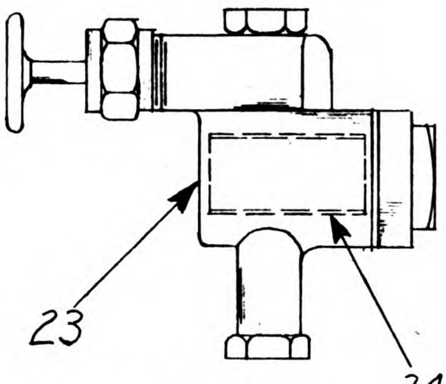


FIGURE 224

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	BU-HA-F1-1	Nozzle, Inner Air
2.	1	BU-HA-F1-2	Burner Body
3.	1	BU-HA-F1-3	Tube, Oil Injector
4.	1	BU-HA-F1-4	Nozzle, Outer Air
5.	1	BU-HA-F1-5	Tip, Oil Injector
6.	3	BU-HA-F1-6	Screw, Back Plate
7.	1	BU-HA-F1-7	Bushing, Oil Injector
8.	1	BU-HA-F1-8	Butterfly Disc
9.	2	BU-HA-F1-9	Screw, Butterfly Disc
10.	1	BU-HA-F1-10	Butterfly Spindle
11.	1	BU-HA-F1-11	Butterfly Handle and Pointer
12.	1	BU-HA-F1-12	Screw, Spring Adjustment

Low Pressure Fuel Oil Burner (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
13.	1	BU-HA-F1-13	Spring, Pressure Pad
14.	1	BU-HA-F1-14	Pressure Pad
15.	1	BU-HA-F1-15	Stop Outer Nozzle
16.	2	BU-HA-F1-16	Screw, Nozzle Stop
17.	1	BU-HA-F1-17	Dial, Indicator
20.	1	BU-HA-F1-20	Stop Screw, Spring Adjustment
21.	1	BU-HA-F1-21	Stop Screw, Butterfly Disc
22.	1	BU-HA-F1-22	Pin, Butterfly Handle
23.	1	BU-HA-F1-23	Oil Valve
24.	1	BU-HA-F1-24	Screen (included in item 23)

SPECIFICATION:

Model - No. 583 Hauck low pressure type with butterfly air valve and 1/4" needle type fuel valve.

PRINCIPLE

This burner is designed to use low pressure air for atomization and efficient burning of fuel oil. It will operate with air pressures from 1/2 to 2 pounds. For heavier oils, from 5° Baume up, for best results use 1 to 2 pounds pressure. For lighter oils use 1/2 to 1 pound air pressure.

The unit consists of an inner air nozzle (1), with an oil injector tube (3) mounted in the center, and an outer air nozzle (4). Air enters the inner air nozzle through tangential slots which give the air a rotary motion. The oil issues from injector tip (5) at the point where the rotating air is at its maximum velocity and the air breaks up and atomizes the oil. The mixture of air and oil leaves through the constructed orifice on the inner air nozzle.

A secondary body of air leaves the outer air nozzle directed into the atomized air an oil mixture at a 45° angle. This produces further atomization and gives direction and velocity to the flame.

MAINTENANCE

The burner requires little attention other than thorough cleaning and replacement of the filter in the fuel valve.

To clean burner parts, remove nozzle stop (15) and unscrew outer air nozzle (4). Disconnect fuel line from needle valve and injector bushing (7) with injector tube (3) and tip (5) may be unscrewed and removed. Inner air nozzle (1) is held to burner body (2) by screws (6).

ASPHALT SUPPLY PUMP

2-1/2" STEAM JACKETED VIKING MODEL #ELQ

BARBER-GREENE SPECIFICATION #PU-VK-C

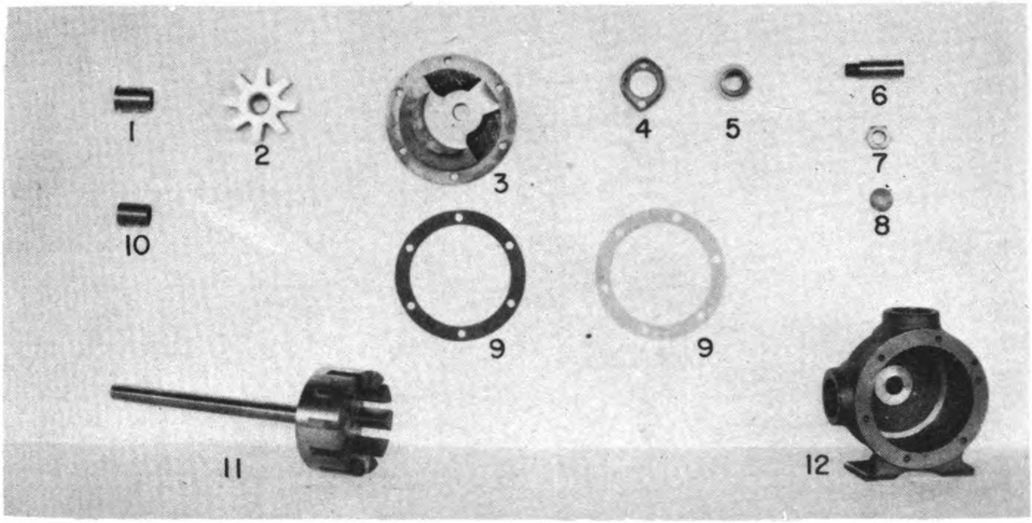


FIGURE 225

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PU-VK-C-1	Casing Bushing
2.	1	PU-VK-C-2	Idler with Bushing
3.	1	PU-VK-C-3	Head
4.	1	PU-VK-C-4	Packing Gland Plate
5.	1	PU-VK-C-5	Packing Gland
6.	1	PU-VK-C-6	Idler Pin
7.	1	PU-VK-C-7	Idler Pin Nut
8.	1	PU-VK-C-8	Idler Pin Disc
9.	1	PU-VK-C-9	Head Gasket
10.	1	PU-VK-C-10	Idler Bushing
11.	1	PU-VK-C-11	Rotor & Shaft
12.	1	PU-VK-C-12	Casing
13.	2	PU-VK-C-13	7/16" Hex Nuts
14.	7	PU-VK-C-14	7/16" x 1" Hex Head Cap Screws
15.	1	PU-VK-C-15	Packing
16.	2	PU-VK-C-16	Packing Gland Studs 7/16" x 4-3/4"
17.	1	PU-VK-C-17	Rotor Key
33.	1	PU-VK-C-33	Flange Gasket
34.	1	PU-VK-C-34	Pipe Flange
35.	1	PU-VK-C-35	T Handle Steam Pet Cock
36.	2	PU-VK-C-36	Grease Cups
37.	1	PU-VK-C-37	Packing Gland Grease Cup
38.	8	PU-VK-C-38	5/8" x 2-1/4" Machine Bolt Nuts & Lock Washers

Asphalt Supply Pump (Continued)

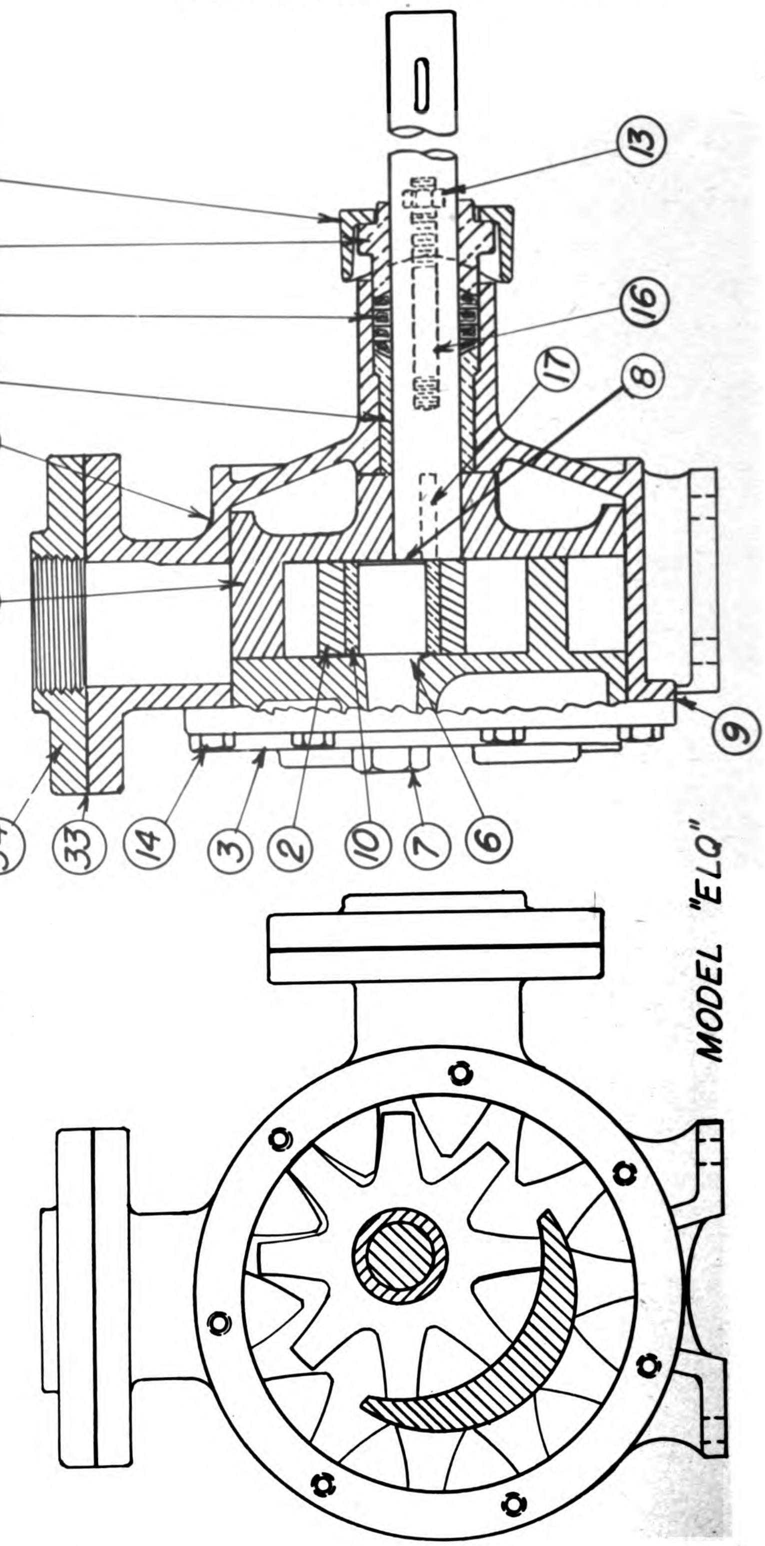


FIGURE 226

BARBER-GREENE COMPANY, Aurora, Illinois

Asphalt Supply Pump (Continued)

SPECIFICATIONS:

Model - ELQ Viking

Size - 2-1/2" Special

Type - All Iron Steam Jacketed

Capacity - Up to 90 gallons per minute at 397 R.P.M. depending on viscosity of bitumen and lift required.

Rotation - Counter clockwise facing drive end.

PRINCIPLE OF OPERATION

With every revolution of the pump shaft a definite amount of liquid is drawn into the pump, filling the spaces between the teeth in the idler and rotor as they pass the inlet port. The liquid is forced out of these spaces into the outlet or discharge port by the meshing of the teeth at a point midway between the two ports.

The amount pumped per minute varies in proportion to the revolutions per minute of the pump.

Refer to the accompanying illustration.

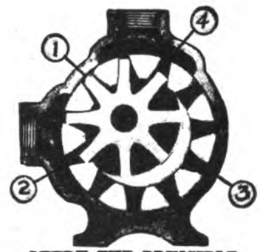


FIGURE 227

Rotor and idler mesh at position 1 forming a complete barrier between ports. At position 2 the idler is drawing away from the rotor, creating a suction and an opening which is filled with the liquid being pumped. At position 3 the spaces between the rotor and idler teeth are filled and are carrying their load around to position 4 where the idler teeth mesh again, forcing the liquid out the discharge port.

CONSTRUCTION

The Viking Pump is fitted with all iron parts with the exception of the bushings and packing gland which are furnished in bronze and the rotor shaft and idler pin which are furnished in steel.

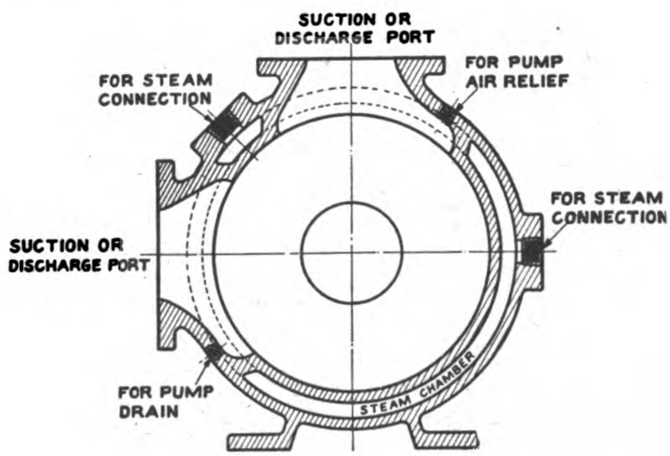
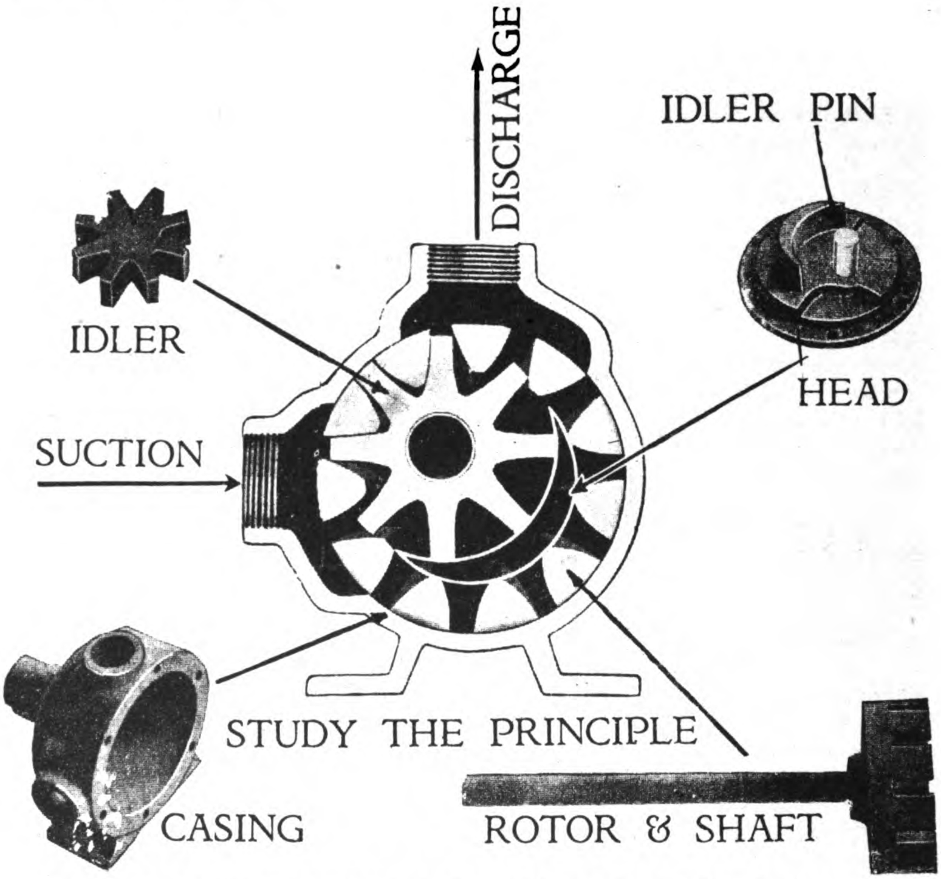


FIGURE 229

Steam Jacketed Body

The Model EQSJ pump is equipped with steam jacketed body as shown in illustration, so that steam or hot water can be circulated around casing, for handling heavy bitumen.

OPERATION AND MAINTENANCE



Above are illustrated the major parts of the Viking Pump—casing, head, rotor and idler, separately and assembled. Imagine the rotor and idler in motion operating in a counterclockwise direction. Follow the course of the liquid from point of suction to point of discharge.

FIGURE 228

The simple two moving parts, "Gear within a gear", will give dependable service if clean liquids are used to eliminate excessive wear on the close fitting parts. All fittings on suction side of pump should be tight, so that full suction can be maintained.

In normal operation the pump requires the following attention:

(1) Keep grease cups filled (see lubrication chart).

(2) If packing gland #5 leaks take up studs #16 one-quarter turn at a time to stop leak. If taken up more than necessary, the shaft will heat, causing a scored shaft. A small drip is not objectionable.

(3) If new packing is required proceed as follows: Remove studs #16 and slide gland #5 out from packing box. Make a ring of packing by wrapping a length of packing around shaft and cut ends to meet. Insert one or more of these rings, as required, and replace gland and adjust as described above.

(4) If pump is removed and reinstalled, make sure that pump is properly aligned. After installation, the pump shaft should turn freely after bearing is pulled down tight.

Before putting pump in operation, remove front cover, and with feeler gauge check clearance of .018" to .020" all around between rotor and casing. This is the only assurance that shaft is properly aligned.

Disassembly Remove hex nuts (13) on studs (14) and take off head (3) which has idler pin (6) held in place by nut (7). Idler with bushing (2) slides on pin (6) with disc (8) at end of pin. Pipe flanges (34) are held to casing (12) by studs and hex nuts.

Rotor and shaft (11) may be pulled out of the case. Note thrust washers (18) and (20) back of rotor hub.

Packing gland (5) is held in place by studs (16). Rotor bearing sleeve (4) is mounted on the case with studs (14) and nuts (13).

UNSATISFACTORY PUMP OPERATION

Should the transfer pump fail to operate satisfactorily, check for the following possible causes:

(1) Air Leak in Suction Line - make sure all fittings in suction line are tight and not pulling air into the line.

(2) Cold Spot in Line - too great a length of suction line unjacketed, allowing the bitumen to "freeze" in the line at that point. A cold spot can be detected by feeling the temperature of the pipe at various stations beginning at the storage tank and working toward the pump. If the line is warm or hot, the bitumen is flowing at that point. If the line is cold at any point there is a possibility that the bitumen at that point is sufficiently stiff to prevent proper flow. Heat cold sections by discharging live steam around the "cold spot" or by heating with some type of torch.

(3) Pump Needs Priming - to prime pump, screw the male end of a one-half inch street elbow into the bitumen drain cock, and screw a piece of one-half inch pipe approximately one foot long into the female end of the street elbow. Turn the pipe so it extends downward. With pump running, take a pail full of bitumen and bring it into a position so the pipe is immersed in the bitumen. Then open cock. The suction created will pull bitumen out of the pail and cause a sufficient prime. Close cock before bitumen in the pail lowers sufficiently to allow air to be pulled into the priming pipe.

ASPHALT METERING PUMP

1-1/4" KINNEY TYPE SD-312

BARBER-GREENE SPECIFICATION #PU-K-E1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PU-K-E1-1	Cylinder
2.	1	PU-K-E1-2	Open Bearing Head
2a.	1	PU-K-E1-2a	Closed Bearing Head
3	1	PU-K-E1-3	Bearing Lining for Open Head
3a.	1	PU-K-E1-3a	Bearing Lining for Closed Head

Asphalt Metering Pump (Continued)

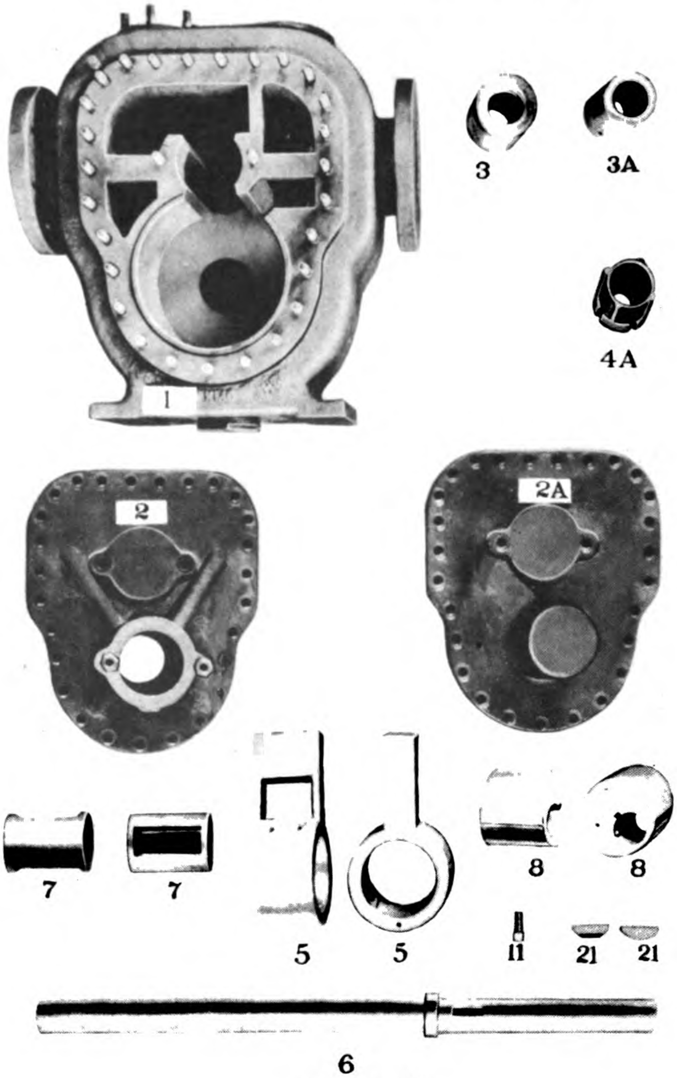


FIGURE 230

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
4a.	1	PU-K-E1-4a	Stuffing Box Nut
5.	2	PU-K-E1-5	Piston
7.	2	PU-K-E1-7	Slide Pin
8.	2	PU-K-E1-8	Cam
9.	1	PU-K-E1-9	Shaft
10.	54	PU-K-E1-10	Cylinder Studs
11.	2	PU-K-E1-11	Bearing Set Screws
21.	4	PU-K-E1-21	Shaft Key
22.	3	PU-K-E1-22	Packing 1/4" Square x 3/4" I.D. Ring Garlock #5263

Asphalt Metering Pump (Continued)

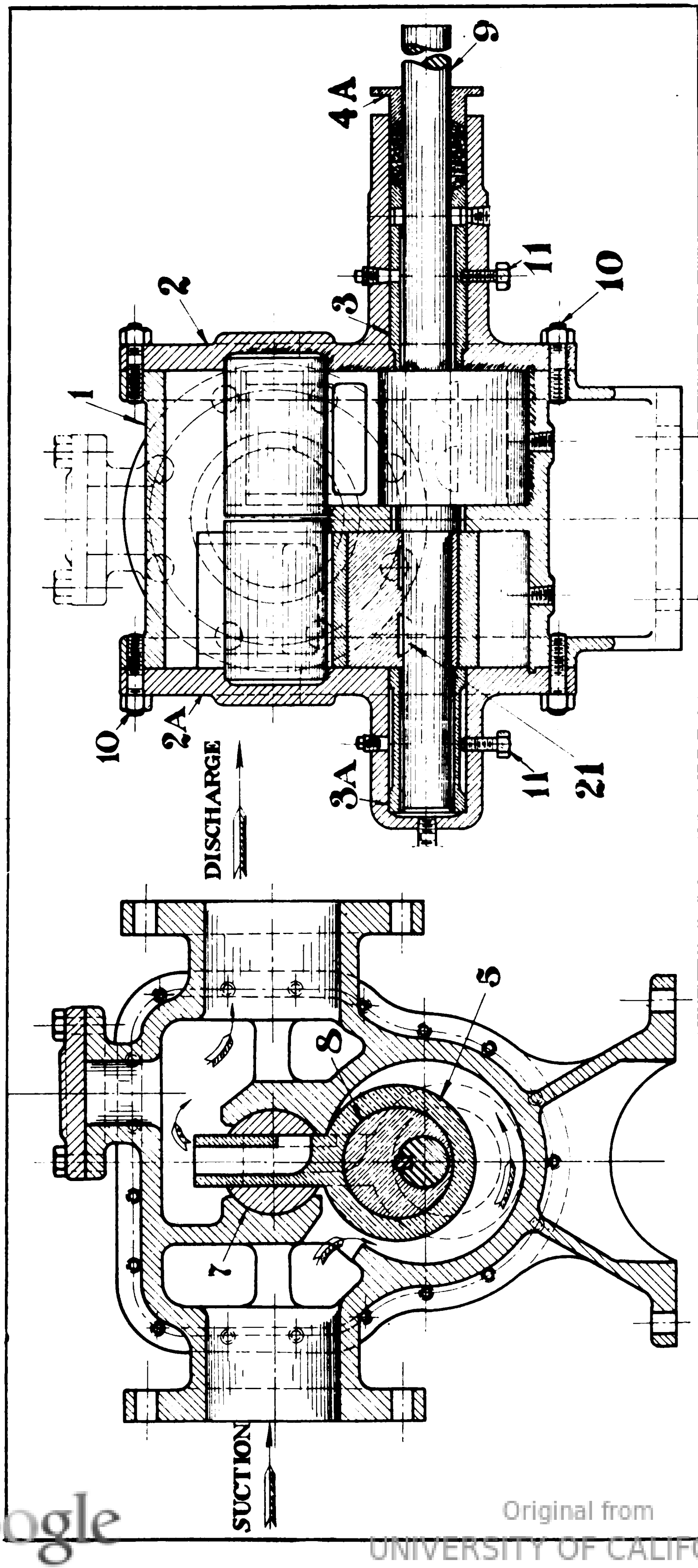


FIGURE 231

SPECIFICATIONS:

Model - SD-312

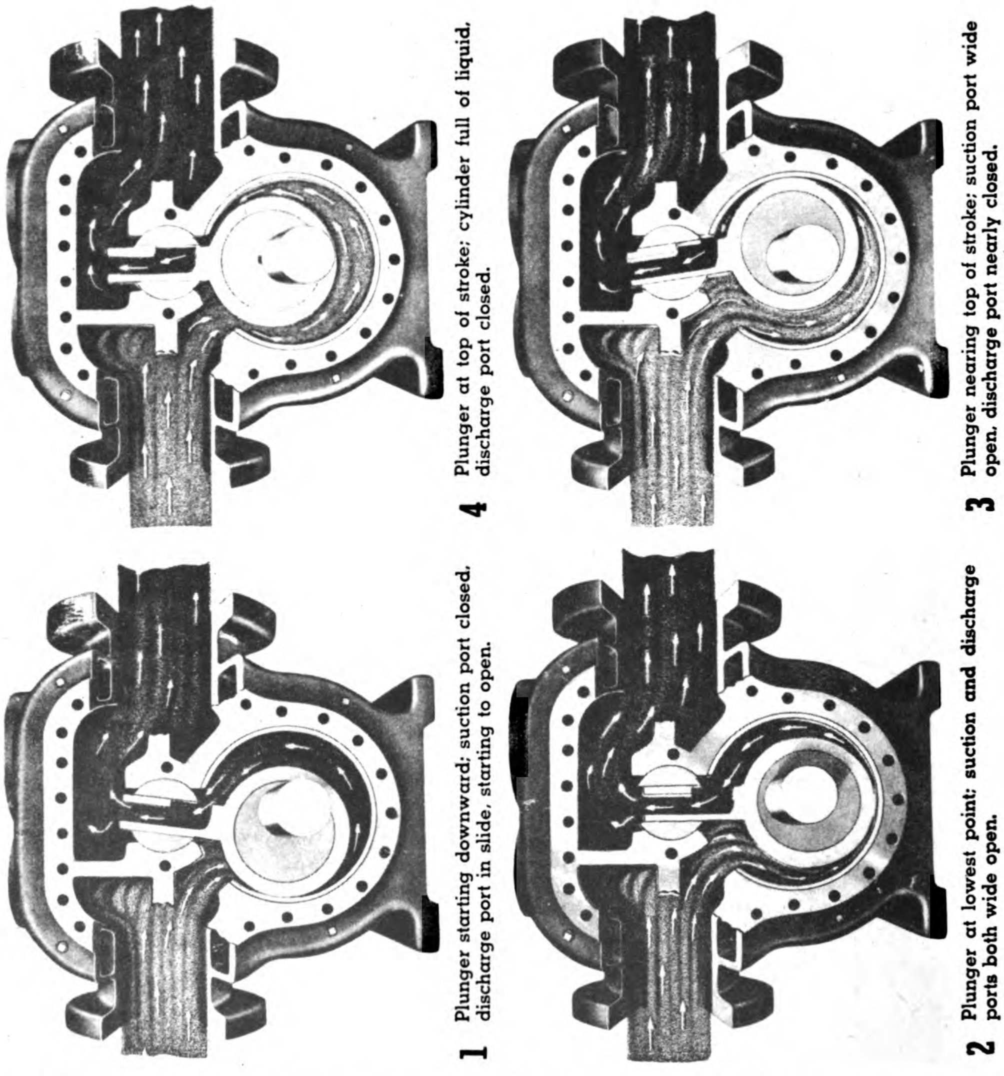
Size - 1-1/4" Special

Type - Steam Jacketed

Capacity Range - 2.07 G.P.M. to 8.5 G.P.M.

Rotation - Counter-clockwise

PRINCIPLE OF OPERATION



1 Plunger starting downward: suction port closed, discharge port in slide, starting to open.

2 Plunger at lowest point: suction and discharge ports both wide open.

3 Plunger nearing top of stroke; suction port wide open, discharge port nearly closed.

4 Plunger at top of stroke; cylinder full of liquid, discharge port closed.

The main operating parts consist of two pistons or plungers each with a hollow arm which slides in a slide pin. The pistons are mounted on eccentrics, set 180 apart on the main drive shaft.

With every revolution of the pump a definite amount of liquid is drawn into the suction port, and is forced by the cam or eccentric plungers into the cam through the discharge port.

The amount pumped per minute varies in proportion to the revolutions per minute of the pump.

The pump is equipped with two eccentric plungers opposing each other, assuring a uniform flow of liquid at the exhaust port.

CONSTRUCTION

The Kinney pump will operate in one direction only (see specifications).

The Kinney Pump is fitted with all iron parts with the exception of the bushings and packing glands which are furnished in bronze and the rotor shaft and slide pins which are furnished in steel.

OPERATION AND MAINTENANCE

The simple moving parts of the Kinney Pump will give dependable service, if clean liquids are used to eliminate excessive wear on the close fitting parts. All fittings on suction side of pump should be tight, so that full suction can be maintained at all times.

Pump is steam jacketed so that either water or steam can be circulated through the pump housing to prevent freezing of the working parts by bitumen.

In normal operation the pump requires the following attention:

(1) Before starting pump be sure valve in discharge line is open.

(2) Grease regularly. Do not run the pump empty any longer than necessary. These pumps depend upon the liquid pumped for internal lubrication and lack of lubrication will cause damage to the working parts.

(3) If packing gland leaks take up packing gland a little at a time to stop leak. If taken up more than necessary, the shaft will heat, causing a scored shaft. A small drip is not objectionable. When packing gland has been taken up all the way it is an indication that a new packing is required. If new packing is required proceed as follows: remove packing gland and slide back over shaft away from hot packing box. Make a ring of packing up wrapping a length of packing around shaft and cut ends to meet. Insert one or more of these rings, as required, and replace gland and adjust as described above.

(4) If pump is removed and reinstalled, make sure that pump is properly aligned. After installation, the pump shaft should turn freely, after bearing is pulled down tight.

LOCATING TROUBLE - No Liquid Delivered

(1) Stop pump immediately.

(2) Pump may not be primed and should be filled on the discharge side.

(3) Leakage or opening in suction line permitting air.

(4) Pistons installed wrong (see figure 232).

REDUCTION IN CAPACITY

(1) Air leakage in suction or through stuffing box. Oil and

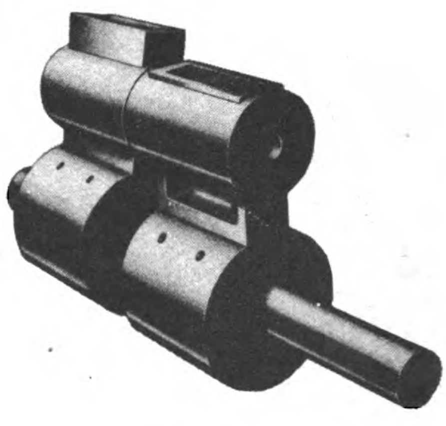


FIGURE 232

tighten stuffing box gland and paint suction pipe joints with shellac.

(2) Pump may be worn if long in service.

(3) Valves partly closed on suction side or the suction in the suction line.

(4) Pistons installed improperly. (Refer to figure 232)

(5) Vaporization of liquid in suction due to high temperature.

(6) Air or gas pockets in the suction line.

NOISY OPERATION

(1) Insufficient supply coming to the pump.

(2) Air or gas pockets in the suction.

(3) Pump out of alignment, causing metallic contact between the pistons and the casing.

(4) Operating against excessive pressure.

RAPID WEAR

(1) Grit or dirt present in the liquid being pumped.

(2) Pipe strain on pump casing through misalignment causing working parts to bind. Release connection and check alignment.

(3) Pump operating against excessive pressure.

(4) Pump running dry without liquid.

MAINTENANCE AND REPAIRS

All working parts of the pump except the drive shaft are arranged in duplex, opposed at an angle of 180°, giving perfect balance and eliminating pulsation. The assembly of the internal parts with the shaft are shown in figure #232. When removing pistons, care should be taken to replace these in the same position as originally making sure that the hollow part of the slide in this piston is toward the discharge side of the pump. On the pistons there is a stamp marked such. This should face the intake side of the pump.

No gaskets are used in connection with the Kinney Pump. The head and cylinder castings are tongued and grooved, requiring simply a light coat of shellac to prevent leakage. Before the shellac is applied and the heads replaced on the pump body they should be cleaned of all foreign material so as to allow clean surface for the new shellac.

Disassembly - This pump may be readily taken apart by removal of the hex nuts on the cylinder studs (10), and removing open bearing head (2) and closed bearing head 2A.

Slide pins (7) fit into housing and over piston (5). Cams (8) are keyed to shaft (9).

CENTRIFUGAL WATER PUMP

2" x 6-1/2" - TYPE U
AMERICAN WELL WORKS

BARBER-GREENE SPECIFICATION #PU-AM-A1

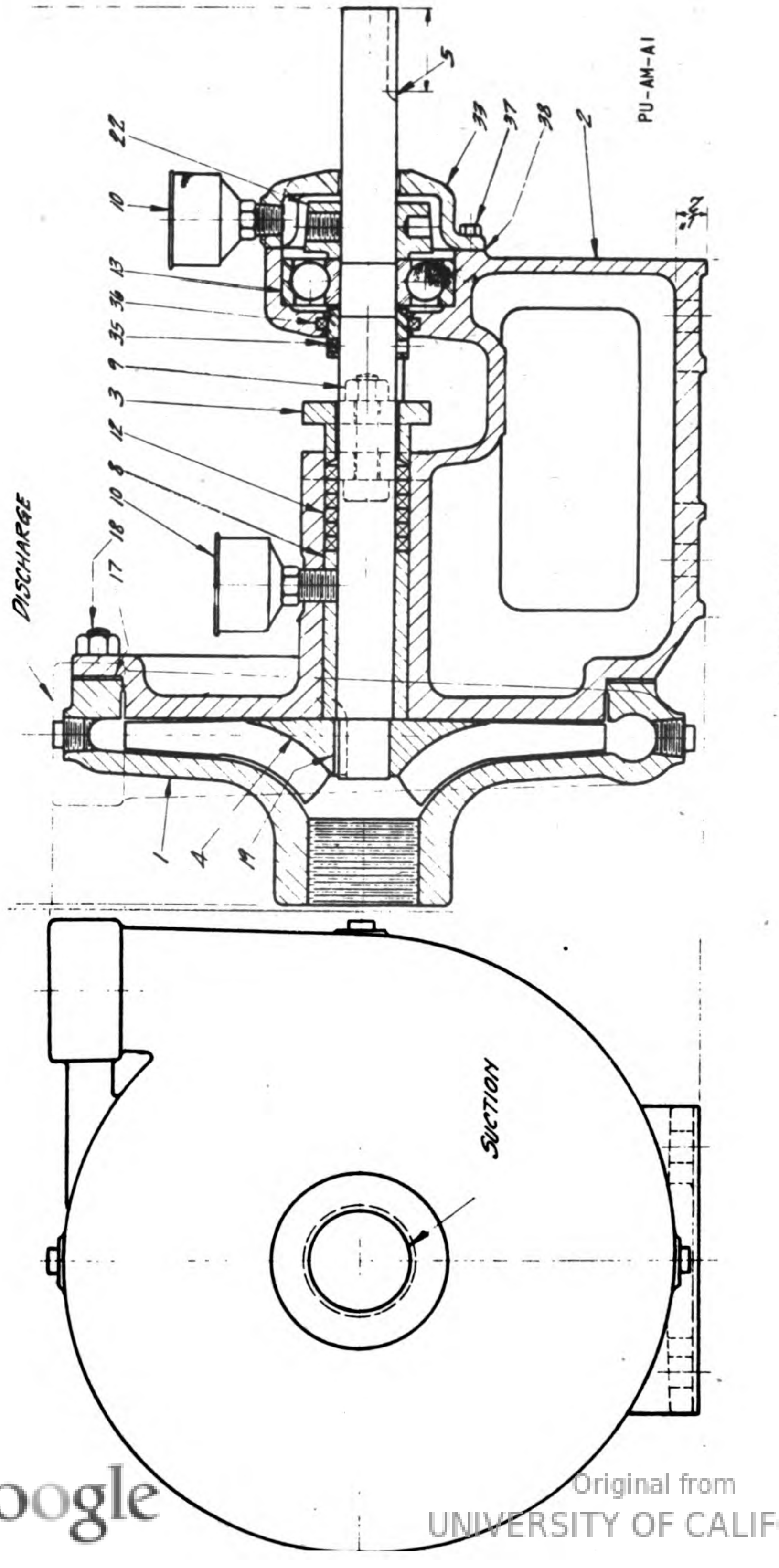


FIGURE 233

– Centrifugal Water Pump (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	PU-AM-A1-1	Shell
2.	1	PU-AM-A1-2	Comb. Cover, Pack. Box & Bearing
3.	1	PU-AM-A1-3	Gland
4.	1	PU-AM-A1-4	Impeller
5.	1	PU-AM-A1-5	Shaft
8.	1	PU-AM-A1-8	Cover Sleeve
9.	2	PU-AM-A1-9	Pack. Box Bolts & Nuts
10.	2	PU-AM-A1-10	Grease Cup
12.	1	PU-AM-A1-12	Packing
13.	1	PU-AM-A1-13	Ball Bearing
17.	1	PU-AM-A1-17	Shell Gasket
18.	8	PU-AM-A1-18	Shell Studs and Nuts
19.	1	PU-AM-A1-19	Impeller Key
22.	1	PU-AM-A1-22	Thrust Collar
33.	1	PU-AM-A1-33	Ball Bearing Cap.
35.	1	PU-AM-A1-35	Collar
36.	1	PU-AM-A1-36	Felt Ring
37.	4	PU-AM-A1-37	Cap Screw - Cap to Bearing
38.	1	PU-AM-A1-38	Paper Gasket - Cap to Bearing

SPECIFICATIONS:

Model - "U"

Size - 2" x 6-1/2"

Type - Single suction, single stage centrifugal

Capacity - 100 U.S. Gallons per minute @ 1500 R.P.M.

Assembly - Right Hand

Rotation - Clockwise facing drive end.

OPERATION AND MAINTENANCE

Water intake is located at end of impeller shaft (marked suction). When impeller #4 rotates, a suction is created at the intake, pulling water into contact with the impeller blades. The rotation of the curved impeller blades causes the water to be thrown by centrifugal force into the outer channel of the pump head #1. From the channel the water is expelled by force out of the discharge outlet.

In normal operation, the pump requires little attention, which can be outlined as follows:

(1) Keep grease cups #10 filled with grease (see lubrication chart), screw the cups down about two turns every four hours. Be sure grease cup shank is screwed in tight. A loose shank will allow air to be pulled into pump reducing the suction at inlet.

(2) If packing gland #3 leaks take up on packing gland bolts #9 one quarter turn at a time until leak stops. Be careful not to take up bolts more than needed to stop leak. If taken up too much, the pump shaft will heat, causing a scored shaft. A small drip of water is not objectionable.

(3) If new packing is required, proceed as follows: Remove bolts #9 and slide gland #3 out from packing box. Make a ring of packing by wrapping a length of packing around shaft and cut so ends meet. Insert one or more of these rings, as required, and replace gland and adjust as described above.

(4) If pump is removed and reinstalled, make sure that pump is properly aligned when pulling down bolts, because there is a danger of warping the pump body, causing the shaft to bend and heat. After installation, the pump shaft should turn freely.

(5) Do not run pump with discharge line closed. When pumping against a closed valve, the churning of water causes heat, which will damage the pump. If no water is needed for an indefinite period remove "V" belt on pump drive.

Disassembly - Shell (1) is held in place by studs and nuts (18) and may be readily removed. Impeller (4) is keyed to the end of shaft (5). Packing gland (3) is held to case by bolts and nuts (9). Collar (35) is set screwed in place on shaft in bearing hub. Bearing cap (33) is held to case by cap screws (37), with felt ring (34) located in hub. Shaft may be taken out after removal of thrust collar (22).

WATER METER

1-1/2" NIAGARA TYPE FV SOLID CASING
BUFFALO METER CO.

BARBER-GREENE SPECIFICATION #WM-BM-A1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
63.	1	WM-BM-A1-63	Straight Reading Register
63b.	1	WM-BM-A1-63b	Straight Rdg. Dial Face Only (Included in 63)
62.	1	WM-BM-A1-62	Stuffing Box Nut
62a.	2	WM-BM-A1-62a	Stuffing Box Washer, cork
64.	1	WM-BM-A1-64	Register Change Gear
65.	1	WM-BM-A1-65	Meter Change Gear
65a.	1	WM-BM-A1-65a	Idler Change Gear
66.	1	WM-BM-A1-66	Top Intermediate Train Gear
67.	1	WM-BM-A1-67	First Intermediate Train Gear
68.	1	WM-BM-A1-68	Second Intermediate Train Gear
69.	1	WM-BM-A1-69	Intermediate Pinion with Shaft (Included in 75)
70.	1	WM-BM-A1-70	Roller (included in 75)
71a.	2	WM-BM-A1-71a	Screw - for Change Gear (Included in 64 and 65)
71b.	8	WM-BM-A1-71b	Screw - for Register Dial and Plate (Included in 63)
71c.	2	WM-BM-A1-71c	Screw - for Holding Register
71d.	2	WM-BM-A1-71d	Screw - for Register Box
71e.	2	WM-BM-A1-71e	Screw - for Gear Plate
71f.	4	WM-BM-A1-71f	Screw - for Disc Chamber
72.	2	WM-BM-A1-72	Intermediate Gear Pivot (Included in 75)
73.	1	WM-BM-A1-73	Pinion Driver Block only without Shaft (Included in 73b)
73b.	1	WM-BM-A1-73b	Pinion Driver Complete (Shaft, Pinion Block and Nut)(Included in 75)
74b.	1	WM-BM-A1-74b	Diaphragm, Standard Type (Included in 78)
75.	1	WM-BM-A1-75	Intermediate Gear Plate Complete
75b.	1	WM-BM-A1-75b	Driver Hole Bushing only (Included in 75)

Water Meter (Continued)

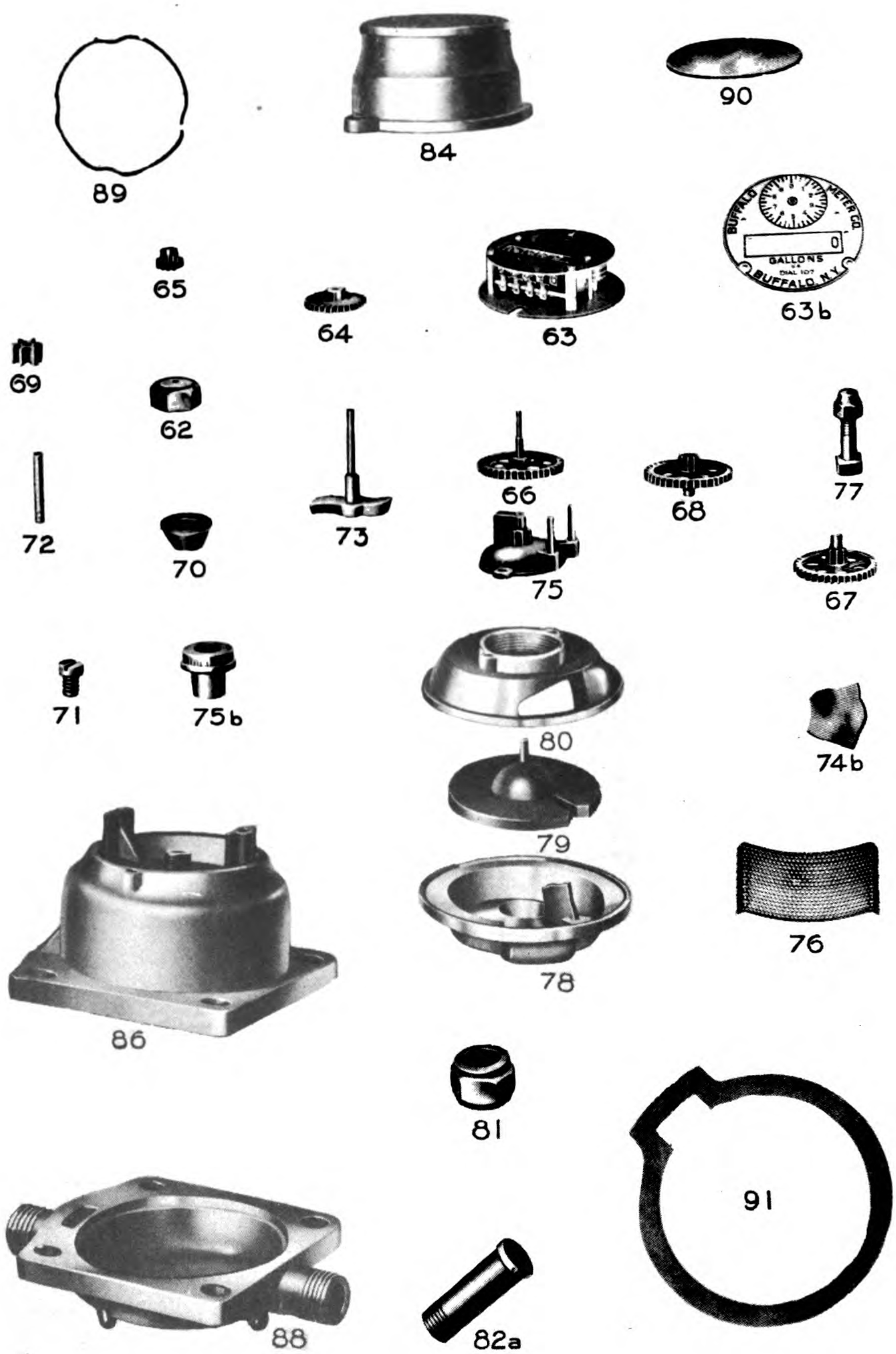


FIGURE 234

Water Meter (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
76.	1	WM-BM-A1-76	Strainer
77a.	10	WM-BM-A1-77a	Steel Bolt and Steel Nut
78.	1	WM-BM-A1-78	Disc Chamber Bottom with Diaphragm
79.	1	WM-BM-A1-79	Disc Piston - Diameter 6.5" with Reinforced Rubber Disc for Cold Water, Complete
79b.	1	WM-BM-A1-79b	Disc Pin only, Bronze, for one-piece Disc (included in 79)
80.	1	WM-BM-A1-80	Disc Chamber Top
81.	2	WM-BM-A1-81	Coupling Nut
82a.	2	WM-BM-A1-82a	Coupling Spigot, Straight
84b.	1	WM-BM-A1-84b	Galvanized Cast Iron Register Box Complete
86.	1	WM-BM-A1-86	Galvanized Cast Iron Top Casing
88.	1	WM-BM-A1-88	Galvanized Cast Iron Solid Type Bottom Casing
89.	1	WM-BM-A1-89	Retaining Spring for Glass (Included in 84b)
90.	1	WM-BM-A1-90	Glass for Register Box (Included in 84b)
91.	1	WM-BM-A1-91	Casing Gasket for Solid Casing Type, cold water
92.	2	WM-BM-A1-92	Coupling Washer

SPECIFICATIONS:

Model - Type FV - Niagara

Size - 1-1/2" Solid Base

Dial - Straight Reading type in U. S. gallons

Capacity Range - 18 to 65 gallons per minute

Recording Range - 0 to 99,999,999 U. S. gallons

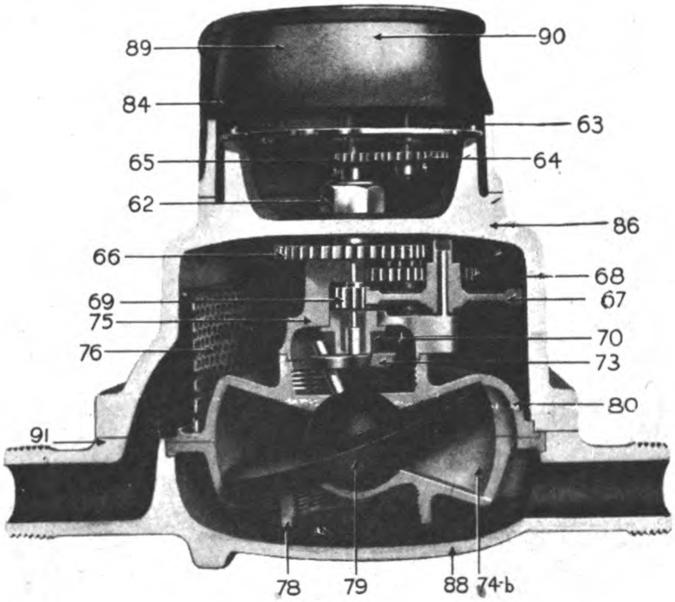
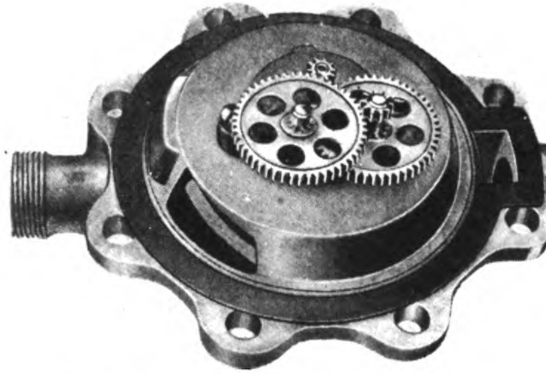
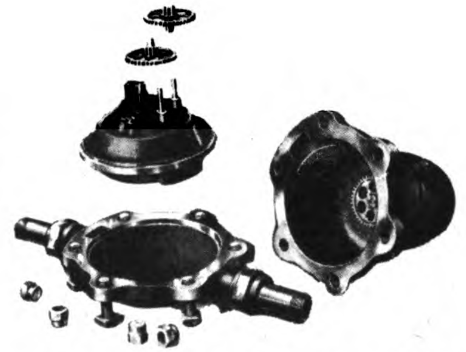


FIGURE 235

Water Meter (Continued)



Meter works assembled without top casing, showing position of parts



Meter opened at bolted flanges, showing how parts may be immediately opened

FIGURE 235A

PRINCIPLE

The meter is domestic type recorder for measuring the consumption of water in U.S. gallons. It is a displacement nutating piston type (sometimes referred to as the "Wobble Plate Type".)

The liquid enters the meter at the inlet and passes upward through the strainer #76 into the top of the main casing. Here it submerges and lubricates the internal gearing. From this point it moves down through the measuring chamber #74-b and discharges through the meter outlet. The liquid passing through the measuring chamber drives the measuring piston #79, which nutates, or rocks around on its central ball. The piston pin drives the cam #73, which in turn drive the internal gearing and actuates the register #63.

Water must be free from solids in suspension, except that a small amount of non-abrasive solids in colloidal suspension may be handled without difficulty.

SERVICING THE METER

Cleaning of Meter:

When contaminated water is metered, meter must be frequently cleaned to obtain accuracy. To clean proceed as follows:

(1) Remove bolts - all bolts from main flange.

(2) Carefully lift off top casing #86.

(3) Lift out measuring chamber #74b and #80.

(4) Clean out all parts with Kerosene or water. Make sure strainer #76 is clean.

(5) Replace parts in reverse order as removed. Do not attempt to force any part in place. If each part does not slip in place easily, it is not properly aligned.

(6) If gasket #91 is damaged, cut a new gasket the same shape and thickness as used one.

(7) When bolting the top casing to the bottom, tighten the bolts progressively and uniformly to prevent binding.

READING THE METER

The recording apparatus consists of small dial and a register. The revolving hand on the small dial records 100 U.S. gallons for each revolution of the hand. The dial is numbered from 1 to 10. Each division represents 10 gallons. Each division between numbers is divided into 5 equal parts representing 2 gallons each.

The register is of the automotive type for recording mileage except that it has 6 wheels and just to the right of the right hand wheel there are two dead zeros stamped on the dial face. These zeros correspond to the gallons recorded on the small dial. For example: (to obtain a reading, take the reading shown on the register including the two dead zeros and add to it the reading of the small dial for the total meter reading. For any given run, subtract the total reading at start from the total reading at finish.) The meter will read up to 99,999,999 gallons.

OPERATION

The principles governing the operation of a Niagara water meter can be summarized as follows:

(1) Control valve must be on outlet side of meter.

(2) Air in water line will cause meter to read in excess of actual passage of water. To keep air out of line do not drain meter water line between periods of use and see that suction and pump stuffing boxes are tight.

(3) Use clean water to protect meter from sediment and scale. Clean meter when necessary (see instructions "Cleaning the Meter"). Foreign matter will clog the meter and cause it to read less than the actual passage of water.

(4) Do not allow asphalt to get into the meter. Use the meter only for water for which it is designed.

PRESSURE TANK AND BURNER

Pressure Tank

AEROIL 20 GALLONS

BARBER-GREENE SPECIFICATION #TA-AE-A1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
18.	1	TA-AE-A1-18	Valve Wheel
19.	1	TA-AE-A1-19	Valve Wheel Nut
20.	1	TA-AE-A1-20	Valve Stem Nut
21.	1	TA-AE-A1-21	Valve Stem
24.	1	TA-AE-A1-24	Pump Handle
25.	1	TA-AE-A1-25	Pump Handle Nut
26.	1	TA-AE-A1-26	Pump Handle Spring
27.	1	TA-AE-A1-27	Pump Plunger Rod
28.	1	TA-AE-A1-28	Pump Barrel Spring
29.	1	TA-AE-A1-29	Pump Plunger Back Washer
30.	1	TA-AE-A1-30	Pump Leather Cup Washer
31.	1	TA-AE-A1-31	Pump Plunger Steel Washer
32.	1	TA-AE-A1-32	Pump Plunger Nut
33.	1	TA-AE-A1-33	Tank Oil Needle Valve
35.	1	TA-AE-A1-35	Tank Filler Cap
37.	1	TA-AE-A1-37	Tank Oil Syphon Pipe

Pressure Tank and Burner (Continued)

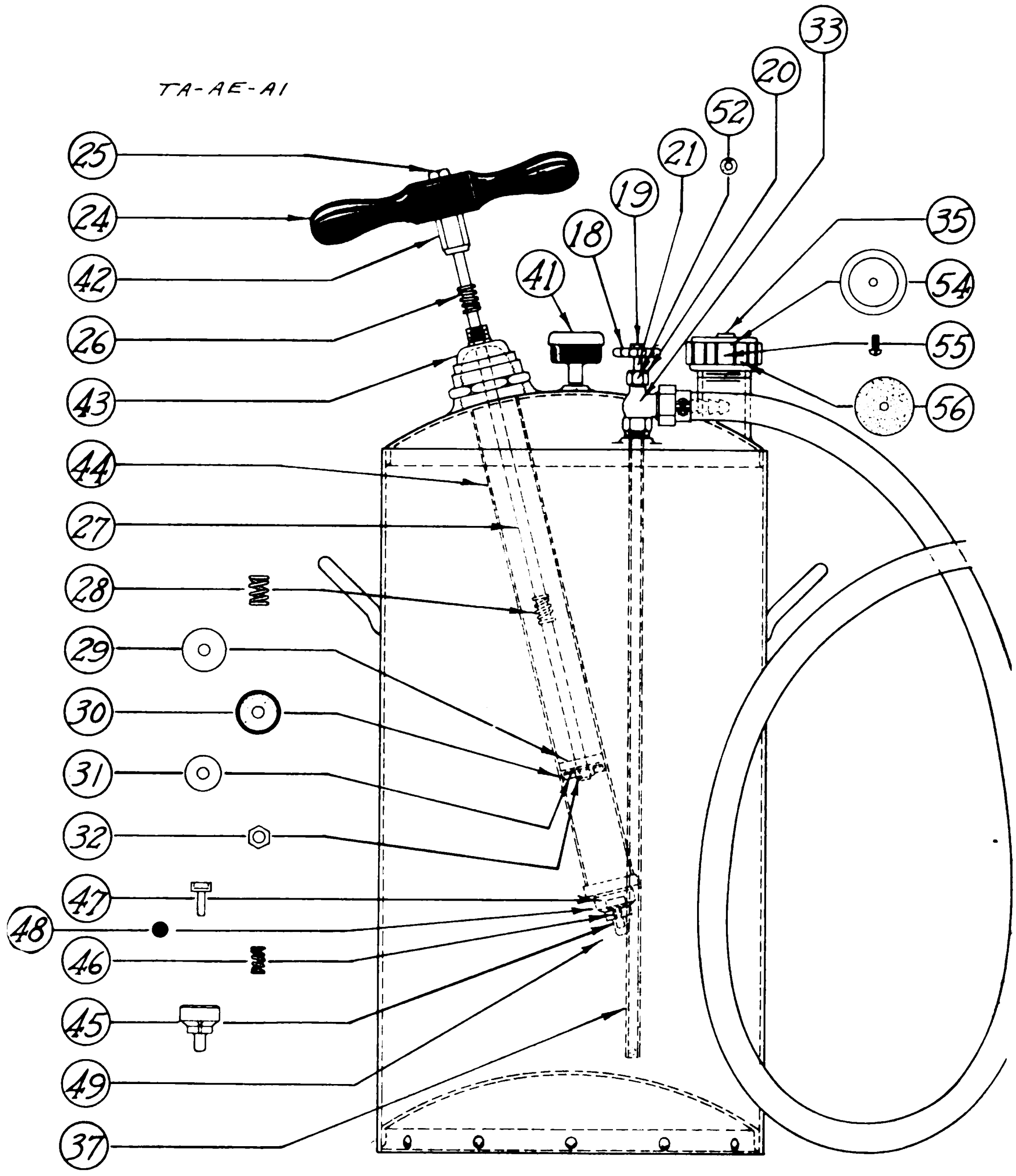


FIGURE 236

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
40.	1	TA-AE-A1-40	1/4" x 1/2" Reducer
41.	1	TA-AE-A1-41	Tank Pressure Gauge
42.	1	TA-AE-A1-42	Pump Brass Nipple
43.	1	TA-AE-A1-43	Pump Brass Bell
44.	1	TA-AE-A1-44	Pump Barrel with Tank Bushing
45.	1	TA-AE-A1-45	Pump Check Valve Cap
46.	1	TA-AE-A1-46	Pump Check Valve Spring
47.	1	TA-AE-A1-47	Pump Check Valve Stem
48.	1	TA-AE-A1-48	Pump Check Valve Composition Seat
54.	1	TA-AE-A1-54	Filler Cap, Back Washer, Steel
55.	1	TA-AE-A1-55	Filler Cap, Back Washer, Screw
56.	1	TA-AE-A1-56	Filler Cap Cork Gasket

Pressure Tank and Burner (Continued)

Burner - Torch Type

AEROIL MODEL #13BG

BARBER-GREENE SPECIFICATION #BU-AE-A1

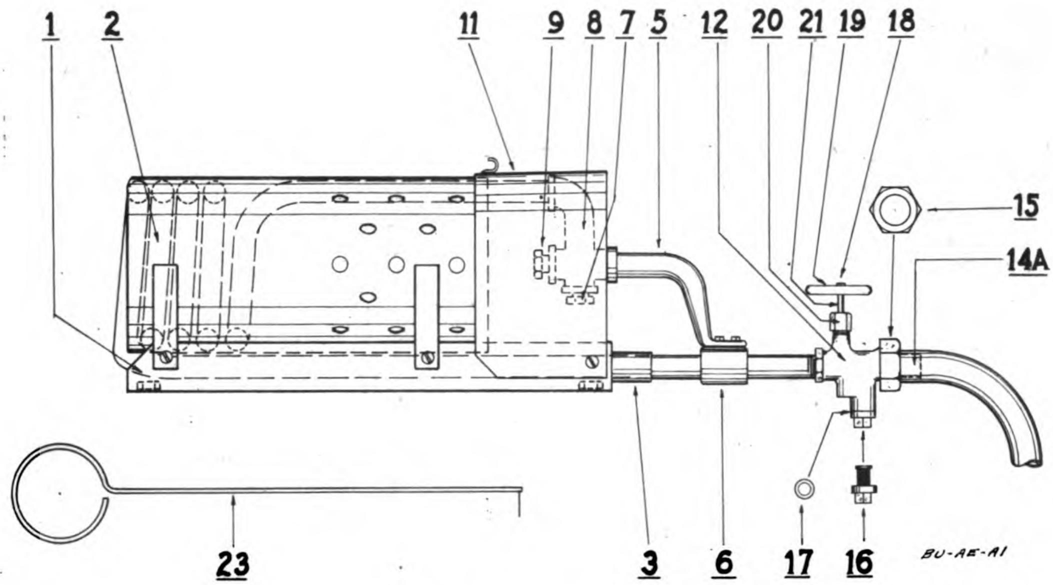


FIGURE 237

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	1	BU-AE-A1-1	Burner Shell and Pan
2.	1	BU-AE-A1-2	Burner Coil
3.	1	BU-AE-A1-3	Torch Coupling
5.	1	BU-AE-A1-5	Plug holder Bracket
6.	1	BU-AE-A1-6	Bracket Tee with Screws
7.	1	BU-AE-A1-7	Plugholder Cap
8.	1	BU-AE-A1-8	Plugholder only
9.	1	BU-AE-A1-9	Burner Plug #42
9.	1	BU-AE-A1-9G	Burner Plug #33
11.	1	BU-AE-A1-11	Burner Windshield
12.	1	BU-AE-A1-12	3/8" Burner Valve-strainer
14a.	1	BU-AE-A1-14a	7/8" x 1/4" Union
15.	1	BU-AE-A1-15	Hose Union Nut only
16.	1	BU-AE-A1-16	Strainer Basket only
17.	1	BU-AE-A1-17	Strainer Washer
18.	1	BU-AE-A1-18	Valve Wheel
19.	1	BU-AE-A1-19	Valve Wheel Nut
20.	1	BU-AE-A1-20	Valve Stem Nut
21.	1	BU-AE-A1-21	Valve Stem
23.	1	BU-AE-A1-23	Cleaning Needle

SPECIFICATIONS:

Model - #13 BG Aeroil Burner

Size - 20 Gallon Tank

Pressure Tank & Burner (Continued)

PRINCIPLE

The Burner and Tank are designed to operate simultaneously.

The Pressure Tank has a 20 gallon fuel capacity and is equipped with a hand pump for air pressure, a pressure gauge and a valve for control of fuel flow to the burner. The air pressure forces the fuel into the line connecting the tank to the burner.

The Burner is designed to pre-heat the fuel in coils so that it is vaporized and discharged through the burner plug in a spray for efficient combustion.

OPERATION

See "Tank Heating System" under "Plant Operation."

MAINTENANCE

If the pump does not catch, it is evident that the leather cup washer #30 has lost its flexibility. Unscrew brass bell #43 and remove pump plunger rod #27 from the pump and soften cup washer #30 with oil, working oil into leather with fingers.

If the pump handle doesn't stay down at the end of the stroke, it indicates that there is fuel oil in the pump, and it is evident that the check valve parts #45, 46, 47, and 48 are out of order. Remove entire pump and clean or repair check valve parts. Usually the trouble can be traced to dirt in check valve seat #48.

There is no maintenance required on burner except to see that hose connections and valves are free from leaks.

HYDRAULIC JACK

BLACKHAWK MODEL #CB-10.5-C CAPACITY 8 TON

BARBER-GREENE SPECIFICATION #HJ-BL-A1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1.	2	1.03	Drive Screw
2.	1	CB9.05-2	Base
3.	1	1.06-1	Base Plug
4.	1	CB9.10	Release Valve Spindle
5.	1	CB9.11	Release Valve Packing Nut
6.	1	1.16	7/32" Ball
7.	1	S1.16	5/16" Ball
8.	1	CB11.18	Oil Strainer Screen
9.	1	CB9.20	Top Cap
10.	1	CA11.21	Gland Nut
11.	1	C9.22	Filler Plug
12.	1	CB10.525-1	Reservoir
13.	1	1.26E	Name Plate
15.	1	CB10.528	Plunger Adjusting Screw
16.	1	CB9.29	Plunger Plug
17.	1	CB10.530-1	Cylinder
18.	1	C9-37	Filler Plug Gasket
19.	1	CB10.540-1	Plunger
20.	1	M7.341	Plunger Cup
21.	1	CA11.42	Plunger Cup Retaining Screw
22.	1	5.43	Plunger Cup Spreader
23.	1	AA10.45	Saddle

Hydraulic Jack (Continued)

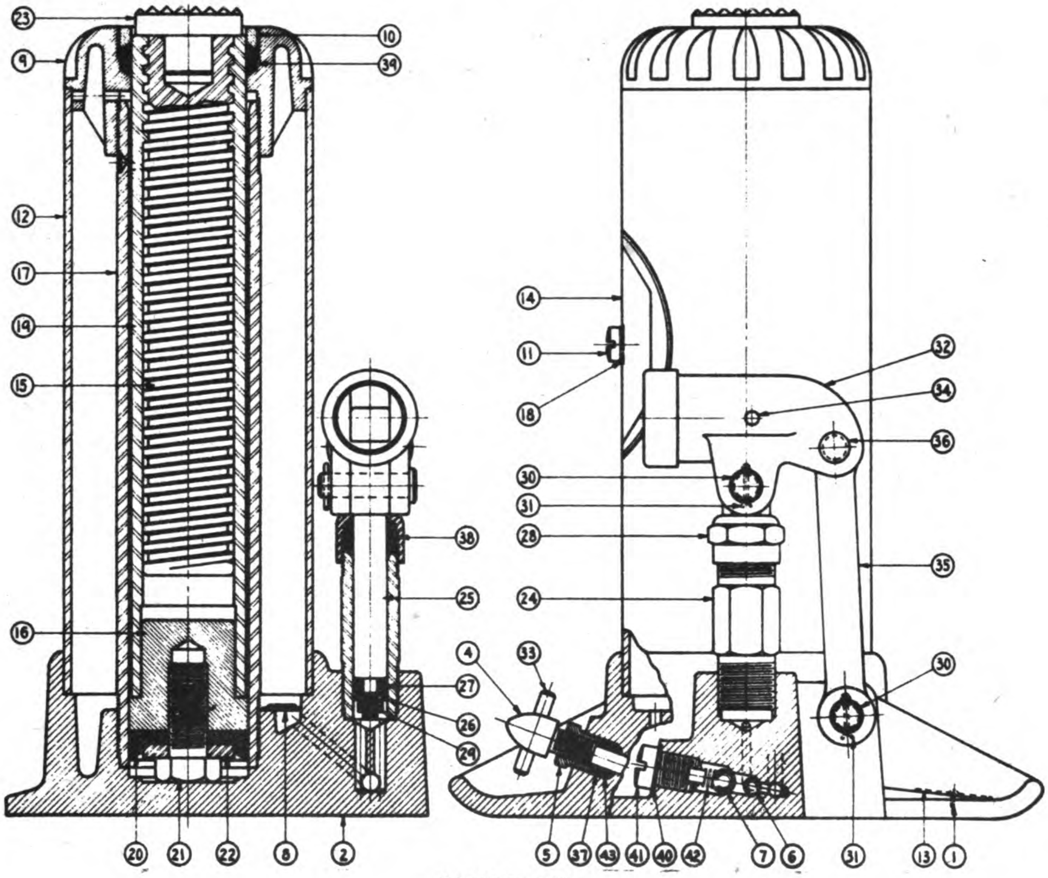


FIGURE 238

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
24.	1	CB9.50	Pump Cylinder
25.	1	CB9.51	Pump Plunger
26.	1	F11.52	Pump Cup Spreader
27.	1	F11.53	Pump Cup
28.	1	CB9.54	Pump Gland Nut
29.	1	CB9.55	Pump Cup Retaining Nut
30.	2	CB9.57	Beam Pin
31.	2	1.58	Cotter Pin
32.	1	CB9.60	Beam
33.	1	S4.61	Release Valve Spindle Pin
34.	1	CB9.61	Beam Handle Pin
35.	1	CB9.62	Link
36.	1	CB9.63	Link Rivet
37.	1	1.74	Release Valve Packing
38.	2	5.75	Pump Packing
39.	2	CA11.76	Plunger Packing
40.	1	S1.167B	Valve Plug Gasket
41.	1	CB9.185	Valve Plug
42.	1	S1.183	Outlet Valve Spring
43.	1	CB9.335	Release Valve Packing Washer
	1	No. 2-1	Jack Handle (two-piece 34" long)
	1		Blackhawk Hydraulic Oil #30 24 Cu. In. (about 7/8 pint)
			Assemblies
	1	CB10.540C	Plunger Assembly only (Items 15,16,19 &23)
	1	CB10.540D	Plunger Assembly Complete (Items 15,16,19, 20,21,22,23)

Hydraulic Jack (Continued)

SPECIFICATIONS:

Model - Blackhawk Model #CB10.5-C

Capacity - 8 Ton

Size - 10-1/2" high by 7-3/4" lift

Type - oil motor truck type with two piece handle

PRINCIPLE

When pump handle is raised plunger #25 raises which causes the oil in reservoir to be forced by check ball #6 filling the pump cylinder #24 with oil. On downward stroke pump plunger #25 forces oil back into the oil channel causing check ball #6 to shut and check ball #7 to open. Oil passing through check ball #7 passes directly into main cylinder #17 causes ram plunger #19 to raise which in turn lifts the load. For lowering release valve #4 is opened all the way allowing oil, forced under pressure by load on main plunger #19 back in the reservoir #12.

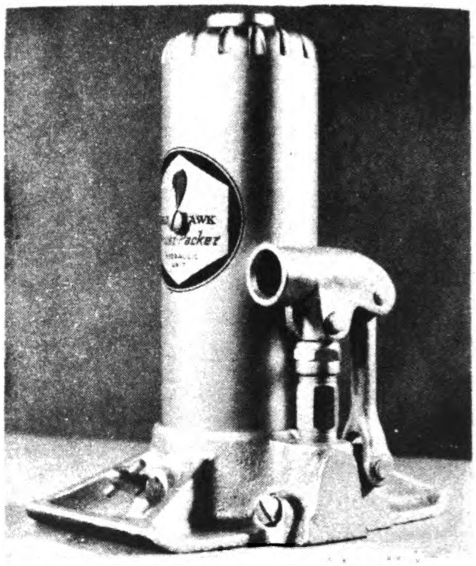


FIGURE 239

OPERATION

To raise load place jack under object, turning out screw extension either all the way or until saddle #23 contacts load. Raising per screw adjustment is to be able to take advantage of full hydraulic lift. Turn release valve #4 with pump handle engaging slots in handle with cross pin #33. Place pump handle on pump beam #32 and with upward and downward strokes on handle, jack will raise load. To lower, remove pump handle from pump beam #32 placing it over release valve #4 and speed of lowering will depend upon the amount release valve (4) is open.

MAINTENANCE

If jack does not hold load, either the main plunger of packing #20 is leaking or check ball #7 is not feeding.

If the cup leaks, remove top cap #9, reservoir #12 and cylinder #17. This will permit removal of entire plunger assembly, then remove retaining nut #21 and spreader #22, install new cup #20 and reassemble. Plunger assembly should always be put into the cylinder with the saddle #23 entering the cylinder first. The reason for this is to keep the main plunger cup #20 from distorting.

If leak is due to check ball #7 not feeding, remove valve plugs #41, spring #42, and finally ball #7. Use a magnet to clean out any chips that might be on valve seat, replace check ball #7 and tap lightly using small hammer and brass rod. Reassemble valve plugs.

If leakage occurred around pump cylinder #24, remove cotter pin and beam pin, then with open end wrench remove pump cylinder #24. Push pump plunger #25 sufficiently so cup #27 clears bottom of pump cylinder #24. Remove #29 pump cup retaining nut and #26 pump cup spreader installing new pump cup #27.

Hydraulic Jack (Continued)

Reassemble, place pump plunger assembly into pump cylinder and reassemble entire assembly into pump base.

Always use Blackhawk oil #71 when available. WARNING: Hydraulic brake or shock absorber fluid, alcohol, glycerine, castor oil will ruin cups because such fluid dissolves sizing which seals the pores in cup leathers and corrodes valve seats and cylinder walls. Use of these fluids waives guarantee. Use only SAE 10 or 10W as substitute.

ENGINE SECTION

LeRoi Model D201-P3 Gasoline Engine

Barber-Greene Specification No. EN-L-A11

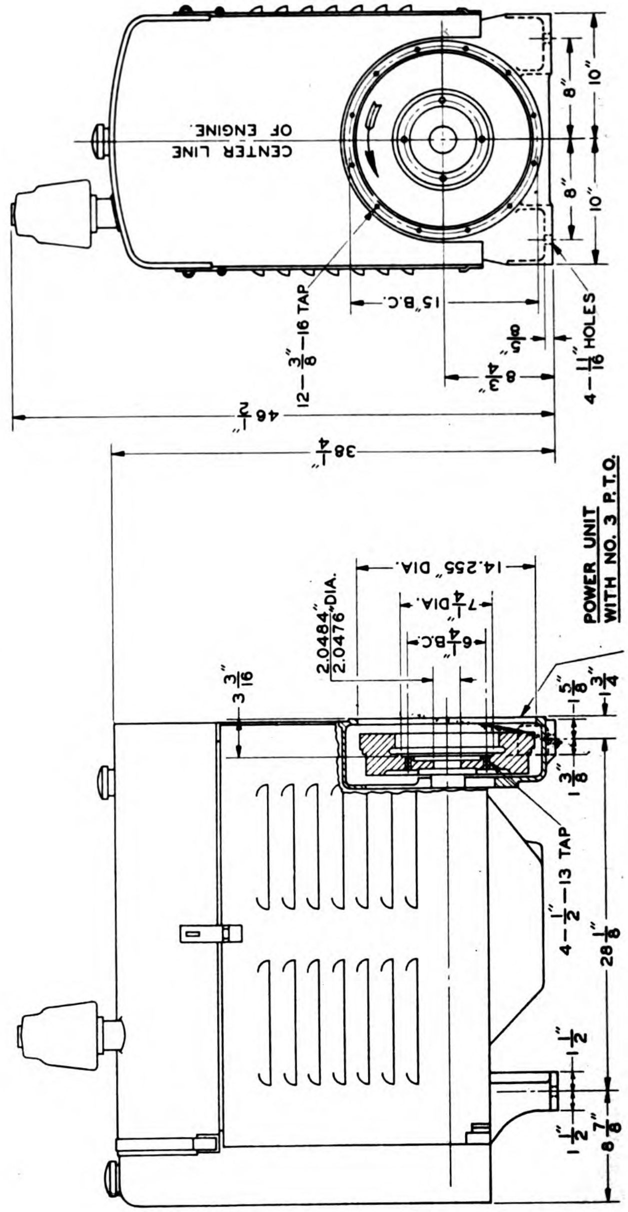
CONTENTS

I. GENERAL INFORMATION

A. Specifications

MODEL - D201P3 LE ROI GASOLINE ENGINE

DIMENSIONS



A. Specifications (Continued)

MODEL - D201P3 LE ROI GASOLINE ENGINE

Weight - Approximately 765 lbs.
Bore - 4"
Stroke - 4"
Displacement - 201 cu. inches
Cylinders - 4
Valves - Overhead with inserts for exhaust seats.
Piston Rings - 3 compression
1 oil
Fan - 17" dia., four blade
Water Pump - Centrifugal type.
Oil Pump - Gear type
Capacities - Engine and Radiator (water) - 4 gallons
Crankcase (oil) - 7 quarts
Fuel Tank (gasoline) - 12 gallons
Air Cleaner (oil) - 1 pint
Governed Speed - 1400 R.P.M. (full load)
Horsepower - 36
Fuel Consumption - 3.3 gallons per hour at 1400 R.P.M.
Oil Consumption - 22 quarts per 100 hours

B. Accessories for D 201 P3 Le Roi Engine

FOR MOBILE UNITS NOS. 821, 831 AND 841

DESCRIPTION	LEROI CO. NUMBER	MANUFACTURER'S NUMBER	MANUFACTURER'S NAME
Air Cleaner	A77-211	A5329	Donaldson Co., Inc. St. Paul, Minnesota
Pre-Cleaner	A43-133	1537-A	Donaldson Co., Inc. St. Paul, Minnesota
Oil Filter	A77-206	N1540	Motor Improvements Newark, New Jersey
Governor	7A13-270	7A13-270	Le Roi Co. Milwaukee, Wisconsin
Carburetor	A84-331-1	124½ TO	Zenith Carburetor Division Detroit, Michigan
Magneto	A85-126	MJC4C-302	American Bosch Corp. Springfield, Mass.
Spark Plugs	86-8	Type 46	A. C. Spark Plug Co. Flint, Michigan
Ignition Switch	A-76-42	13967	Clum Manufacturing Co. Milwaukee, Wisconsin
Gasoline Strainer	A77-22	OW-418	Tillotson Manufacturing Co. Toledo, Ohio
Choke	A120-2	8974	Clum Manufacturing Co. Milwaukee, Wisconsin

Do Not Order From This List - See Parts List

II. OPERATION

A. Operating Suggestions

Time spent on the inspection and care of the engine will be many times repaid in long life and trouble free operation.

Do not operate engine for any length of time with one or more cylinders weak or missing. Keep the engine in good operating condition. If trouble develops, stop and correct it before it becomes serious.

Keep the engine clean. An operator while cleaning the engine discovers trouble in the making, caused by loose fastenings, leaky connections, etc. Oil should never be allowed to collect on wires or electrical equipment.

Keep the radiator filled with clean lime free water and do not run the engine without water in the cooling system, or add cold water to an overheated engine. If the radiator leaks, have it repaired. Do not use radiator cements that are applied internally, as they hinder the cooling action of the radiator.

Check oil level with bayonet gauge. Use the carburetor choke no more than necessary, as this allows raw gasoline to enter the cylinders, pass the pistons and dilute the oil.

In starting a cold engine allow time for the engine to warm up slowly. Never race a cold engine.

The service life of an engine can be greatly prolonged by a careful breaking-in period.

Don't stop the engine immediately after it has been working hard. Allow it to idle a few minutes to allow the water to circulate and carry away the intense heat. Slower and more even temperature changes aid greatly in preventing warping of valves and distortion of cylinder heads and manifold assemblies.

Don't allow the engine to labor unnecessarily at low speed. It is often desirable to retard the spark until the engine operates smoothly. A good operator will shift to a lower gear just before an engine starts to lug at low speed.

Use a good grade of lubricating oil manufactured by a reliable refinery. See page 708 for oil recommendations.

B. Starting the Engine

When starting any new engine, or an engine that has been standing idle for some time, make the following check-up: -

1. See that there is fuel in the fuel tank.
2. See that the cooling system is full of clean water.
3. See that oil is up to the proper level in crankcase.
4. Open the valve in the gasoline line and allow the carburetor float chamber to fill.
5. Set the throttle lever about one-quarter open if a throttle control is provided.

6. The engine should now be ready to start. With the ignition switch in the OFF position, pull the choke control out as far as possible and crank the engine over two or three half turns. Push the choke control in about 1/8" and turn the ignition switch to the ON position. Do not do this with a warm engine, only when the engine is cold.

7. CAUTION -- Never operate the engine after it is warm with the choke control pulled out, as this will cause an excess of raw fuel to be drawn into the cylinders, resulting in dilution of the crankcase oil or possibly stopping the engine due to an over-rich mixture. If the engine does not start immediately, push in the choke and continue cranking until the engine fires.
In extremely cold weather, when starting is sometimes difficult, crank the engine with the choke control pulled out for a few revolutions, or it may be necessary to pour a small quantity of gasoline into each cylinder through the spark plug holes. Wait a few moments for the gasoline to evaporate, turn on the switch and proceed as before.

C. Cold Weather Hints

A good hot spark from clean correctly adjusted spark plugs is essential in cold weather. The ignition system should be checked at the start of the season.

Be sure the lubricating oil is correct for the prevailing temperatures. See page 708 for oil recommendations.

To start an engine in cold weather, crank one or two revolutions with the choke closed before turning on the ignition switch. Push in the choke half way and open throttle about one-quarter and turn on the ignition switch to start. This prevents extreme flooding. As soon as possible push the choke in to running position. Do not apply load with the choke closed --- wait until the engine warms up.

In extremely cold weather, after stopping the engine at the end of the day, it is advisable to drain the oil into a clean container, this oil to be kept in a warm place or heated before being poured into the engine. This will insure easy starting and proper lubrication at once.

This method will also permit the use of summer oil recommendations in winter when load conditions are severe.

DO NOT RACE A COLD ENGINE.

D. Freezing Mixtures

Denatured Alcohol and Water

Freezing temperature degrees fahrenheit	Amount of alcohol to add to each gallon of water
20	2 Pts.
0	4 Pts.
-20	6 Pts.
-40	10 Pts.
-60	19 Pts.

For example, for each gallon of water placed in the radiator when the temperature draws near 20° below zero, add six pints of denatured alcohol.

Ethyl Glycol (Prestone) and Water

Freezing temperature degrees fahrenheit	Amount of ethyl glycol to add to each gallon of water
16	2 Pts.
0	4 Pts.
-19	6 Pts.
-34	8 Pts.
-49	10 Pts.
-62	12 Pts.

E. Care of the Engine

A GENERAL inspection of the engine should be made at regular intervals, to insure long life and to prevent breakdowns while on the road. One hour a week spent on this inspection will save time and money in the end.

Keep your engine clean. There is nothing that will better promote freedom from engine trouble than cultivating the habit of keeping the engine clean. A dirty engine often covers minor defects or maladjustments that would not become serious if given immediate attention.

1. <u>New Engine after 8 Hours Operation and first 100 hours.</u>

   A. Tighten cylinder head studs and check all other studs, clamps and connections for loose fittings and leaks.

   B. Remove drain plugs on carburetor to clean out sediment. Remove and clean sediment bowl on gasoline strainer.

2. <u>Every 8 to 10 Hours Operation (Daily)</u>

   A. Visual Inspection

      a. See that ignition and other electrical connections are tight.

      b. See that water, gasoline and oil lines are tight.

      c. Check fan belt (tighten if necessary).

      d. Check oil pressure gauge. The indicator should return to zero if not sprung.

   B. Check oil level in crankcase. If necessary to add oil see recommendations page 708.

   C. Check water in radiator.

   D. Clean air filter and refill with fresh oil. Use same grade oil as in crankcase. See page 721.

      Remove air pre-cleaner, inspect center tube and clean, if necessary, with cloth on stick. Clean and empty jar on pre-cleaner.

   E. Turn water pump grease cups down snug.

3. <u>Every 50 Hours Operation</u>

   A. Repeat instructions on 8 to 10 Hour operation.

B. Change oil in crankcase with recommended oil. See page 708. (Drain oil only when engine is hot.)

C. Remove oil filter element, drain and clean filter housing and install new filter element. See page 718.

D. Fill grease cups on water pump with water pump grease of good grade.

E. Remove and clean sediment bowl on gasoline strainer.

F. Remove drain plugs on carburetor to clean out sediment.

4. Every 100 Hours Operation

A. Repeat 50 hours operation instructions.

B. Drain oil while engine is hot and flush out oil pan with one gallon of cheap light oil (SAE #10). Do not use kerosene. While flushing oil in crankcase, run engine at idling speed for two minutes. Drain this flushing oil and refill with 6 quarts of fresh oil to the proper level. Oil recommendations page 708.

C. Check valve adjustment using a feeler gauge. The valve tappet clearances should be .015" when cold, .010" when hot. See page 715.

D. Inspect and remove the carbon deposits from the spark plugs. Examine the porcelain. If it is cracked or chipped either inside or outside, replace the plug. The gap between the electrodes should be .025 of an inch. Adjust the side electrode - never the center one.

E. Remove cover and check magneto interrupter points. See page 723. Lubricate felt wick with few drops of same oil as used in crankcase.

F. Remove cylinder head and crankcase breathers and wash with gasoline. Dry thoroughly.

5. Every 1000 Hours

A. Repeat 100 hour operation instructions.

B. Clean the outside of engine by washing with kerosene, distillate or grease solvent, (if the dirt is thick allow it to soak for ten minutes), then wash off dirt with water.

C. Remove cylinder head, clean carbon, and grind and adjust valves. Always replace cylinder head gasket with a new one. See maintenance section, page 713.

D. Remove oil pan, wash out sludge, if any, and clean oil pump screen. While pan is off, inspect inside of engine to see if cotter pins and locks in connecting rods and main bearing in place, and make sure all connecting rod bolt nuts and main bearing capscrews are tight. Replace oil pan gasket.

E. Remove air cleaner and disassemble unit for a thorough cleaning. Wash unit inner screen with gasoline. See page 721.

F. Test the compression by cranking the engine slowly on each compression stroke. Should the engine turn over easily on all cylinders,

showing poor compression, the cylinder heads should be removed and the valves reground. If one or two cylinders only lack compression, carefully inspect the valve and tappet clearances on these cylinders before removing the head. Insufficient valve clearance will cause burned valves and lack of compression.

G. Install new spark plugs. Check points to .025 inch clearance.

H. Flush radiator with flushing solution as per recommendation page 718.

I. Inspect spark plug cables, and all electric wiring.

J. Check oil circulating system for air leaks.

6. Every 2000 Hours, Major overhaul

A. Repeat 1000 hour operation instruction.

B. Completely disassemble engine and inspect all parts for wear, replace parts where necessary.

C. Clean carbon out of ring grooves of pistons and install new rings.

D. See maintenance section.

F. Lubricating Instructions

1. Lubricating recommendations

The most essential requirement for any successful engine operation is oil. Lack of oil or the use of poor oil is responsible for most engine failures. Use a good quality of oil manufactured by a reliable refinery. The best oil will be found to be cheapest over a long period of engine operation. We recommend S.A.E. 40 for operating temperatures over 90 degrees Fah., S.A.E. 30 for temperatures from 32 to 90 degrees Fah., and S.A.E. 20 for temperatures from 0 degrees to 32 degrees Fah., and S.A.E. 10 for temperatures below 0 degrees. For special high temperatures use S.A.E. grade #50. These numbers correspond to the grades of oil sold by first class service stations.

The use of SAE #50 is not recommended with the exception that it may be indicated for hot climatic and heavy load conditions. Care must be exercised in using this heavy body oil, as the power loss due to using an oil of this weight will result in an increase in oil pan temperature more than offsetting any possible gain in lubricating value.

NOTE: For all Motor Oils, use U.S.Army Spec.#2-104-A of corresponding viscosity. Blend when correct viscosity is not available.

2. Engine Lubrication at 10 - 50 and 100 Hours Operation

Daily - 8 to 10 Hours of Operation

1. Crankcase Oil Level Gauge. Check and add recommended Oil as needed if below "Full" mark.
2. Air Filter. Clean and refill with fresh oil of same grade used in crankcase.
3. Water Pump. Turn grease cups down snug.

Every 50 Hours of Operation

4. Crankcase. Drain while engine is hot and refill with 6 quarts of recommended oil.
5. Oil Filter. Drain, remove element, clean filter housing, and install new filter element.
6. Water Pump. Fill grease cups with good grade of water pump grease.

Every 100 Hours of Operation

7. Crankcase. Drain while engine is hot. Add one gallon of cheap light oil (SAE #10) to flush crankcase. Do Not Use Kerosene. With flushing oil in crankcase, run engine at idling speed for two minutes. Drain the flushing oil and add 6 quarts of oil of recommended grade.
8. Magneto. Remove cover and lubricate felt wick with a few drops of oil same as used in crankcase.

G. Service Chart

I. Troubles -- Possible Causes

ENGINE HARD TO START:

1. Magneto:
   (a) Worn brushes.
   (b) Oil or water soaked.
   (c) Coil damaged.
   (d) Brushes sticking.
   (e) Magnets weak.
   (f) Condenser faulty.
   (g) Points worn or pitted.
   (h) Points sticking.

2. Fuel System:
   (a) No fuel in tank.
   (b) Fuel flow obstructed.
   (c) Air vent in fuel tank filler cap clogged.
   (d) Fuel filter clogged.
   (e) Too much fuel. Carburetor flooded.
   (f) Water in fuel supply.
   (g) Improper fuel mixture.

3. Miscellaneous:
   (a) Loose or defective wiring.
   (b) Spark plugs cracked or shorted by external dirt.
   (c) Spark plugs fouled.
   (d) Cables connected to wrong plugs or coated with paint.
   (e) Throttle or governor valves loose on shafts.
   (f) Intake manifolds or gaskets leaking.
   (g) Valves not seating.
   (h) Improper timing of ignition or valves. Improper tappet clearance.
   (i) Muffler clogged.

FAULTY CARBURETION:

See carburetor instructions.

EXCESSIVE SMOKE FROM EXHAUST:

1. Too much oil in crankcase.
2. Carburetor needle valve open too far.
3. Carburetor float sticking or leaking.
4. Lubricating oil too thin to seal piston rings.
5. Worn bearings, rings, cylinders and valve guides.

EXPLOSION IN MUFFLER:

1. Spark retarded.
2. Weak spark.
3. Valves not seating or out of time.
4. Exhaust valves warped.
5. Missing on one or more cylinders.

ENGINE OVERHEATING:

1. Lack of water.
2. Fan belt slipping.
3. Water hose obstructed.
4. Water hose collapsing.
5. Carburetor choke control partially pulled out.
6. Improper fuel mixture.
7. Radiator clogged.
8. Cylinders limed.
9. Improper ignition timing.
10. Valves leaking.
11. Oil badly diluted.
12. Lack of oil.

ENGINE LACKS POWER:

1. Valves warped or sticking.
2. Valve seats worn.
3. Cylinders or pistons badly worn or scored.
4. Piston rings weak or worn.
5. Piston rings sticking.
6. Improper fuel mixture.
7. Improper timing of ignition or valves.
8. Muffler clogged.
9. Governor or throttle levers loose on shafts.
10. Oil badly diluted.
11. Air cleaner requires cleaning.
12. Fuel not suited to engine.

ENGINE KNOCKS:

1. Excessive carbon deposits in combustion chambers.
2. Loose main bearing.
3. Loose connecting rod bearing.
4. Valve tappet clearances too great.
5. Valves not free in guides.
6. Worn pistons, piston pins or cylinders.

ENGINE KNOCKS (Continued):

7. Engine overheated.
8. Tight pistons or pins.
9. Loose flywheel.
10. Lack of oil or water.
11. Worn timing gears.
12. Spark advanced too much.
13. Fuel not suited to engine. Octane rating too low.

ENGINE MISSING:

1. Spark plugs fouled.
2. Spark plugs cracked or shorted by external dirt.
3. Improper spark plug gap.
4. Defective wiring.
5. Ignition breaker points sticking.
6. Improper breaker point gap.
7. Faulty condenser.
8. Cylinder head gasket leaking.
9. Intake manifold or gaskets leaking.
10. Valves warped or broken.
11. Valves or tappets sticking.
12. Valve tappets improperly adjusted.
13. Valve springs weak or broken.
14. Dirt or water in fuel system.

EXPLOSION IN CARBURETOR OR INTAKE MANIFOLD:

1. Fuel mixture too lean. See carburetor manufacturer's instructions herein.
2. Valves or tappets sticking.
3. Intake valve springs weak or broken.
4. Intake valves warped or broken.
5. Intake tappets set too close.
6. Incorrect timing of ignition or valves.
7. Intake manifold or gaskets leaking.
8. Cylinder head gasket leaking.

POOR COMPRESSION:

1. Valves not seating.
2. Valves or tappets sticking.
3. Valve tappets set too close.
4. Valves incorrectly timed.
5. Weak valve springs.
6. Piston rings sticking, weak or worn.
7. Loose or cracked spark plugs.
8. Cylinder head gasket leaking.
9. Oil too thin to seal piston rings.
10. Scored or worn pistons or cylinders.

II. Important Precautions

1. Do not tamper with the engine governor if you are not thoroughly familiar with it. The governor is correctly set when it leaves the factory. Do not adjust the rod leading from the governor lever to the carburetor lever.

2. Do not remove the grease cups on the water pump, when so equipped, and install pressure type grease gun fittings, as it is very important that these cups, with their reserve supply of grease, be turned down snug, daily. CAUTION - Use water pump grease ONLY.

3. Absolute CLEANLINESS should be the rule at all times, and especially when engine parts are exposed.

4. Do not fail to investigate the cause of backfiring and misfiring.

5. Do not leave the engine out in the weather if it can possibly be avoided. Always protect the end of the exhaust pipe from rain, if the engine is standing idle.

HIGH ALTITUDE OPERATION

Gasoline engine power is reduced when operating at high altitude. The reduced density of the air causes a loss of compression, and the lowered oxygen content reduces combustion efficiency. The power loss is approximately 3 to 3-1/2 percent for each 1000 feet increase in elevation.

Up to an elevation of about 3000 feet, the power loss is due primarily to the decrease in cylinder compression and may be regained by increasing the compression. Up to this altitude the oxygen content of the air is probably sufficient for efficient combustion.

For instance, an engine may be equipped with a high compression head for delivery of normal power output at an elevation of 3000 feet. However, if the engine so equipped is used at higher elevations, the power loss will again be 3 to 3-1/2 percent for each 1000 feet increase in elevation.

If the carburetor is set for operation at normal levels, the fuel mixture will become increasingly rich as the altitude of operation is increased, due to the reduced air density and consequent loss of oxygen. This causes inefficient combustion and carbon deposits. In general, a carburetor set for operation at normal levels will perform satisfactorily up to an elevation of 3000 feet. Above this, the fuel jet should be adjusted or changed to provide the proper ratio of fuel to air for efficient combustion.

III. MAINTENANCE

A. Overhauling Engine

A thorough annual inspection and overhauling of the engine is advisable to determine the exact condition of all moving parts and make such adjustments and repairs as are necessary in order to avoid serious trouble which may develop due to lack of timely attention. The inspection and adjustments should be made by an experienced mechanic.

1. CARBON DEPOSITS:

Incorrect adjustment of the carburetor, resulting in too rich a mixture will cause carbon deposits in the combustion chamber, and on the valves and piston heads; whereas, too lean a mixture will cause the valves to burn. Excessive carbon deposits will also be caused by the use of oils of incorrect body.

2. VALVES:

With the valve cover removed and the cylinder head off, the valves are easily accessible for removal. Before removing the valves, see that each valve is marked with a number corresponding to the number of the port in which it is located. Remove all carbon from the cylinder head, cylinder, exhaust valve pockets, valves and piston heads, taking care not to score the valve faces, seats or cylinders with the scraper.

If the valves and valve seats are badly pitted or warped, it is advisable to reface them.

To reface the valves and seats, the valves should be ground in a refacing machine and the seats, which are, in most cases, hardened inserts, should also be ground. The angle for both the valves and seats should be 45°. The width of the seat should be 1/16".

3. CYLINDER HEAD:

Before replacing the cylinder head, be sure that the surfaces of the cylinder block and head where the gasket rests are absolutely clean.

It is important to securely tighten the cylinder head whenever it is replaced. This must be carefully done to prevent damage to the copper-abestos gasket between the cylinder head and the cylinder block. When installing cylinder head gaskets, place the gasket on the cylinder block with the beaded side up.

First tighten the center cylinder head nut, then proceed diagonally across the head, putting an equal tension on all the nuts. Go over the nuts several times and make certain that all are uniformly tight before starting the engine. IMPORTANT — THIS PROCEDURE SHOULD BE REPEATED AFTER THE ENGINE IS HOT.

4. PISTONS:

Before removing the pistons from the cylinders, mark each piston with the number of the cylinder from which it is to be removed, so that the pistons may be reassembled into the proper cylinder. Thoroughly wash the pistons in clean gasoline or kerosene, particularly the ring grooves and piston pin holes. Remove all abrasive from the pistons and cylinders.

5. PISTON RINGS:

Test all piston rings for fit in the piston ring grooves and replace any rings that are worn. The rings should not be too loose in the ring grooves, but should be sufficiently free to move under their own weight when the piston is rotated.

Piston rings may be removed with the aid of a thin flat piece of steel. A thin flexible knife blade will prove effective in this operation. Be careful not to distort the piston rings when removing or reassembling.

New piston rings must first be fitted in the cylinder bore for which they are intended. Allow a gap clearance of .012". With less clearance, expansion through heat may cause the ring ends to butt, resulting in warped rings or scored cylinders. Assemble the rings on the corresponding piston and make sure they are free in the ring grooves.

6. PISTON PIN FIT:

When the piston pins are held in place by a set-screw in the piston pin boss, the piston pin holes should be reamed so that the piston pins are a hand-push fit at the free end and a slightly tighter fit at the set-screw end.

When the piston pins are not secured in the pistons, the piston pin holes should be reamed so that the piston pins are a hand-push fit.

7. BEARINGS:

The crankshaft and connecting rods should have not less than .008", nor more than .020", end play in the bearing. We recommend a radial clearance of .00075" to .001" per inch of bearing diameter for connecting rod and main bearings.

NEVER ALLOW THE ENGINE TO RUN WITH LOOSE OR BURNED OUT BEARINGS.

The connecting rod and main bearings, on some installations, may be adjusted without taking the engine from its supports.

DO NOT SCRAPE THIN SHELL BEARINGS AND DO NOT FILE CONNECTING RODS OR CONNECTING ROD CAP PARTING FACES.

While caps are off, see that the oil grooves are clean and free, and keep all internal parts of the engine free from dirt.

Replace the cap and turn the nuts down tightly. Try turning the engine over by hand, and make sure that the cap does not bind on the crank pin.

The adjustment is correct when the nuts are tight, the bearings tight on the shims, and the crankshaft may be rotated by hand with the starting crank.

REPLACE THE COTTER PINS AND LOCKING WIRES.

8. CYLINDER SLEEVES:

This engine is designed with removable cylinder sleeves, making reboring unnecessary. Each sleeve is sealed at the bottom end with rubber rings to prevent leakage of water at that point. New rings should always be used when new sleeves are installed, or when, for any reason, the original sleeves are removed. The danger of a water leak into the crankcase is too great to risk the use of the rings a second time.

TO INSTALL CYLINDER SLEEVES:

Remove the cylinder head, oil pan and the piston and connecting rod assemblies. If no puller is available, the cylinder sleeves can be driven out by using a piece of hard wood and a hammer. The lower ends of the sleeves carry rubber sealing rings, and the cylinder block should be cleaned thoroughly at both this and the upper contact point before the sleeves are inserted.

Clean the sleeves thoroughly at the contact points and place the rubber rings in position on the sleeves and cover them with a thin coat of soft soap. Set the sleeve in the bore of the block with the sealing ring end down, and press the sleeve into place. Care should be exercised that the sleeve be pressed down straight in the block to avoid damage to the rubber sealing rings which will result in a water leak into the crankcase.

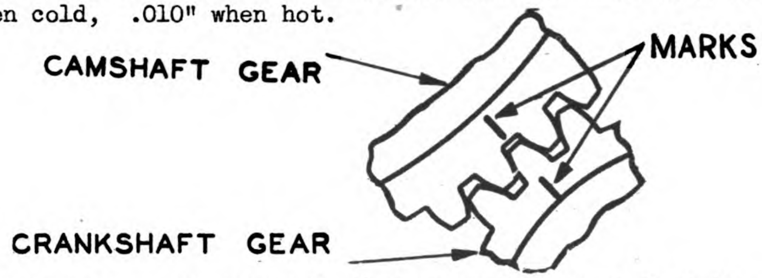
When the cylinder sleeve is in place the top end will project a few thousandths of an inch above the top surface of the cylinder block. This permits the cylinder head to clamp the cylinder head gasket tightly against the top of the sleeve, holding it in place and sealing it at the upper end.

On account of the removable sleeve construction in the cylinder block, oversize pistons and rings are not necessary. When appreciable wear occurs, new standard size parts should be installed.

9. VALVE ADJUSTMENT:

Valve adjustment is provided for by an adjusting screw in the rocker arm.

Each valve must be brought to the closed position before adjustment is made and the clearance between the rocker arm and valve stem should be set at .015" when cold, .010" when hot.



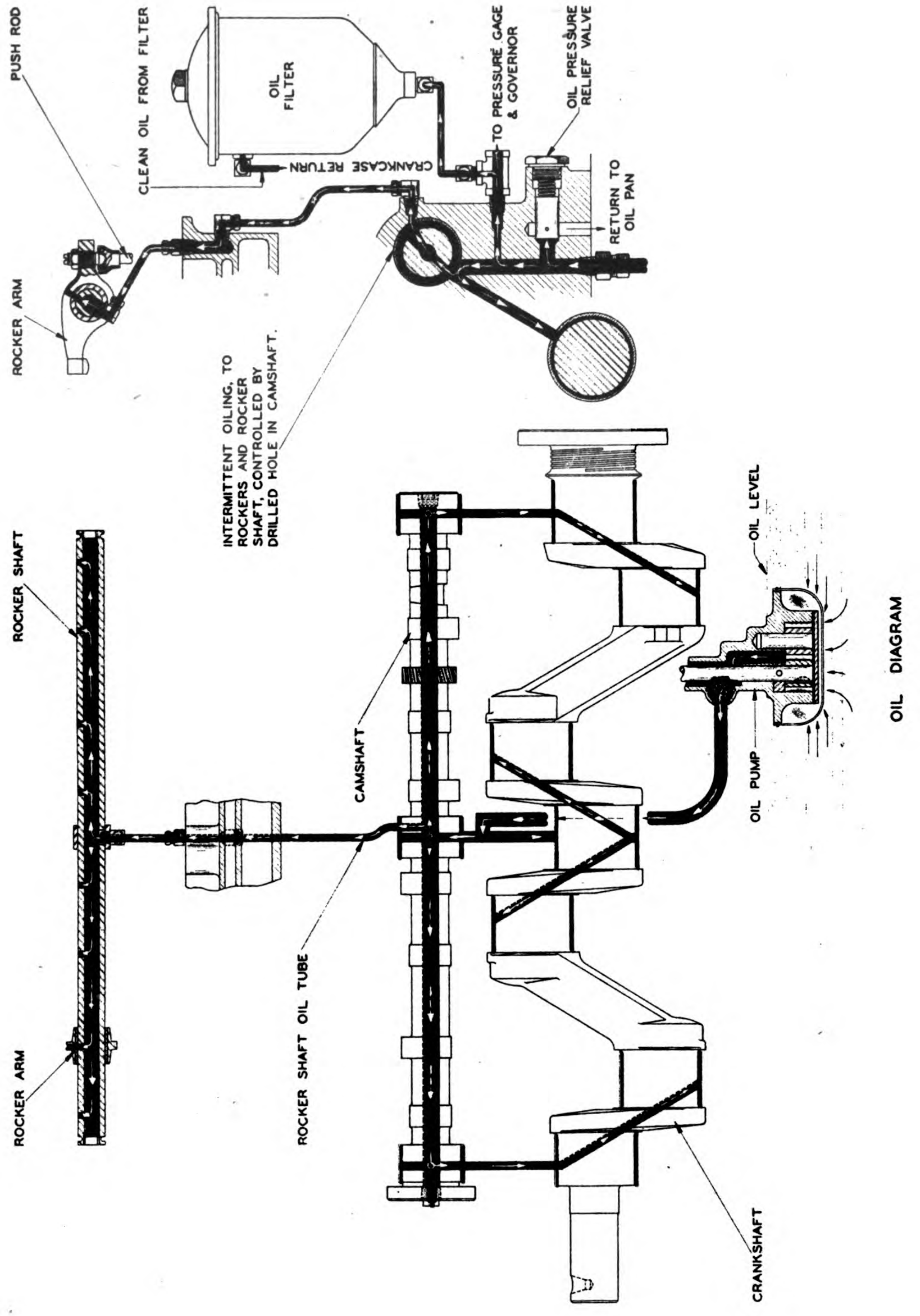
If timing gears are removed, it is very important that the gears be replaced correctly. Mesh the camshaft and crankshaft gears with marks in the positions shown above.

If the timing gear marks are obliterated, or it is deemed necessary to check the valve timing, the chart below may be used.

The columns, 1 to 4 inclusive, show the correct valve timing in degrees as indicated by the valve timing marks on the engine flywheel. After setting the valve clearance, rotate the engine in the direction it is to run, until No. 1 piston is nearly at top center of the compression stroke and then continue to rotate slowly until the proper valve timing mark on the flywheel, as shown in Column 1, lines up with the pointer on the flywheel housing, or other locating point. See Page 723. Then mesh the camshaft gear with the crankshaft gear. Continue to rotate engine and check the valve action on Number 1 cylinder through the complete cycle, comparing the valve position, as shown in Columns 2, 3 and 4, with the flywheel timing marks to make certain the setting is correct.

If the flywheel has no timing marks, follow the same procedure, but set the valves as shown below:-

No. 1 Intake Valve Opens After Top Center	No. 1 Intake Valve Closes After Bottom Center	No. 1 Exhaust Valve Opens Before Bottom Center	No. 1 Exhaust Valve Closes After Top Center	No. 1 Intake Valve Should Open When Piston Is Below Top Center as follows:-
10°	30°	45°	5°	1/32"


PUSH ROD
CLEAN OIL FROM FILTER
OIL FILTER
TO PRESSURE GAGE & GOVERNOR
OIL PRESSURE RELIEF VALVE
CRANKCASE RETURN
RETURN TO OIL PAN
ROCKER ARM
INTERMITTENT OILING, TO ROCKERS AND ROCKER SHAFT, CONTROLLED BY DRILLED HOLE IN CAMSHAFT.
ROCKER SHAFT
ROCKER ARM
ROCKER SHAFT OIL TUBE
CAMSHAFT
OIL LEVEL
OIL PUMP
CRANKSHAFT

OIL DIAGRAM

B. Lubricating System

1. FORCE-FEED SYSTEM:

The oil supply is contained in the oil pan and oil is fed to the moving parts of the engine by a gear-type pump. This pump draws oil out of the oil pan, through a screen of small mesh which prevents foreign material from being drawn into the lubricating system.

An oil pressure relief valve is provided to prevent the oil pressure from building up to an excessive degree, with dial type pressure gauge. The oil pressure for this engine should be 15 to 20 lbs.

NOTE:- Extreme temperatures, load conditions, or the use of improper grades of oil, may cause this pressure to vary.

2. FILLING:

The oil in the engine should be replenished daily, if necessary, in order to maintain the level to the FULL mark on the dipstick.

Never fill the oil pan while the engine is running. Before checking the oil level allow the oil, which has accumulated in the engine, to drain back into the oil pan.

Never permit the oil in the oil pan to get below the half-FULL mark on the dipstick, or below the end of the dipstick when only a FULL mark is shown. Overfilling should also be avoided as this may permit the connecting rods to dip into the oil supply, thus splashing an excessive quantity of oil on the cylinder walls, causing smoking, oil pumping, waste of oil, excessive carbon deposit, fouled spark plugs and sticky valves.

KEEP OIL LEVEL TO FULL MARK AND NO MORE, IF YOU WANT TROUBLE-FREE PERFORMANCE FROM THE ENGINE.

Be sure the filler cap is replaced after refilling to prevent dirt from entering the engine.

3. DRAINING:

It is essential that the oil pan be drained and refilled with new oil at various intervals. The oil gradually accumulates small particles of dust, grit and metal, which will cause wear, and it is also diluted by unburned fuel which passes by the pistons. The oil pan should be COMPLETELY drained when the engine is hot.

DO NOT FLUSH WITH KEROSENE, AS IT DILUTES THE OIL AND IMPAIRS ITS LUBRICATING QUALITIES.

Draining the oil while hot will accomplish all that flushing with kerosene can do in the removal of sediment. Refill the oil pan to the proper level with new oil and replace filler cap.

4. CLEANING THE OIL PAN:

We recommend the practice of removing the oil pan or the crankcase handhole covers at least once a season or 1000 hours of service for inspection of the bearings, etc. At that time the oil pan should be washed thoroughly with gasoline and a stiff brush. DO NOT USE COTTON OR WOOL WASTE, as fibres from it will stick to all rough surfaces, ultimately causing stoppage of the screen and oil lines in the lubricating system.

5. SLUDGE:

The formation of sludge in the oil pan is due to oil contamination caused by exhaust gases which pass the pistons and come in contact with the oil to condense and form an acid. THIS CONDITION WILL BE FOUND MORE OFTEN AND TO A GREATER EXTENT WHEN AN ENGINE IS OPERATED AT TOO LOW A TEMPERATURE. Sludge is very detrimental and if, when draining the oil, it appears to be thick and congealed, the oil pan should be thoroughly cleaned of all sludge. See "DRAINING" above.

6. OIL FILTER:

CLEANING AND SERVICING INSTRUCTIONS

NOTE:- It is necessary to take apart for servicing.

1. Stop engine.
2. Drain Purolator by removing drain plug. Do not throw away this oil as it is clean and should be poured into the crankcase.
3. Turn handle in counter clockwise direction to remove cover.
4. Lift out old element by using handle on top of element (Element cannot be washed.)
5. Insert new element. Be sure handle end is on top.
6. Replace cover and turn handle in clockwise direction until secure, hand tight.
7. Add oil to crankcase to bring to proper level.
8. Start engine and check for leaks.

C. Cooling System

1. RADIATOR:

Clean, lime free water should always be used in the radiator system if it is at all possible to procure it. The use of hard water will cause scale to form in the engine jackets and in the radiator and tend to clog up the circulation system. Dirt, of course, performs the same damage.

The radiator and engine system should be drained and thoroughly flushed out every three months and refilled with clean water as deposits of dirt and foreign matter will accumulate and obstruct the circulation and also the heat transfer values of the radiator and cooling system. If anti-freeze solutions have been in use, it is well to put on new hose connections upper and lower, each year. Anti-freeze solutions have a tendency to cause disintegration of rubber hoses and if this progresses to an acute stage the rubber which crumbles away will pass into the system and fill up water passages, etc., and will also tend to swell up and stop circulation through the water system. Examine hoses carefully at least twice a year and replace when necessary.

Should the water system become clogged, particularly the radiator, one of the first things to do is to remove the connections upper and lower and plug the upper connection, then put a hose on the bottom of the radiator and put on 20 or 30 pounds of water pressure. This reverses the flow and will tend to carry any dirt which has been lodged down in the tubes back upward and out through the top of the radiator. While doing this, allow the radiator to overflow through the top. If the radiator is so badly clogged that this does not serve to free the circulation then the following solutions are to be recommended for cleaning:

1. A solution of one part of muriatic acid to three parts of water in sufficient quantity to fill up the radiator.

2. A solution made up with three or four cans of commercial lye added to a sufficient quantity of water to fill up the cooling system will work very well.

In either case the solution should be heated to luke warm before pouring into the system and should be allowed to stand in the system for three or four hours. After the removal the radiator and engine should be flushed thoroughly with clean water and the system again filled up with clean water.

For freezing mixtures see Operation Section Page 705.

2. FAN:

On this engine the fan is mounted on the water pump shaft and requires no lubrication.

3. WATER PUMP:

The water pump shaft is lubricated by grease cups. Use a good grade of water pump grease.

4. THERMOSTAT:

This engine is equipped with an adjustable type thermostat located between the radiator and cylinder head to control the temperature of the cooling water. Water temperature must be held to at least 160° and may be checked by removing radiator cap and inserting thermometer.

D. The Fuel System

1. PRINCIPLE OF OPERATION:

The fuel system prepares and serves the "food" to the engine. The necessary units to perform this task are a carburetor gasoline strainer, an air-cleaner, and a governor.

The fuel is gravity fed from the fuel tank thru the gasoline strainer to the carburetor. There the raw gasoline is vaporized by the action of the air drawn into the carburetor by the vacuum-suction of the piston action. The air drawn into the carburetor is thoroughly cleaned by an oil bath air cleaner and a collector type pre-cleaning unit, the latter unit prevents large particles of matter from entering the air cleaner, and the oil bath cleaner stops the finer dust and dirt from entering the carburetor. In the carburetor, the proper amount of air is mixed with the fuel to provide the right amount of gas and air mixture for efficient combustion.

The speed of the engine is controlled by the rate of flow of the fuel into the engine. A lever for increasing or decreasing engine speed is connected to a carburetor throttle valve.

The variable speed governor automatically regulates the speed of the engine. When the load on the engine increases, the governor opens the throttle, but will not allow the engine to operate beyond its maximum safe speed. This governor maintains the rate of operation at a constant level, increasing engine power when necessary or decreasing it to the minimum requirements.

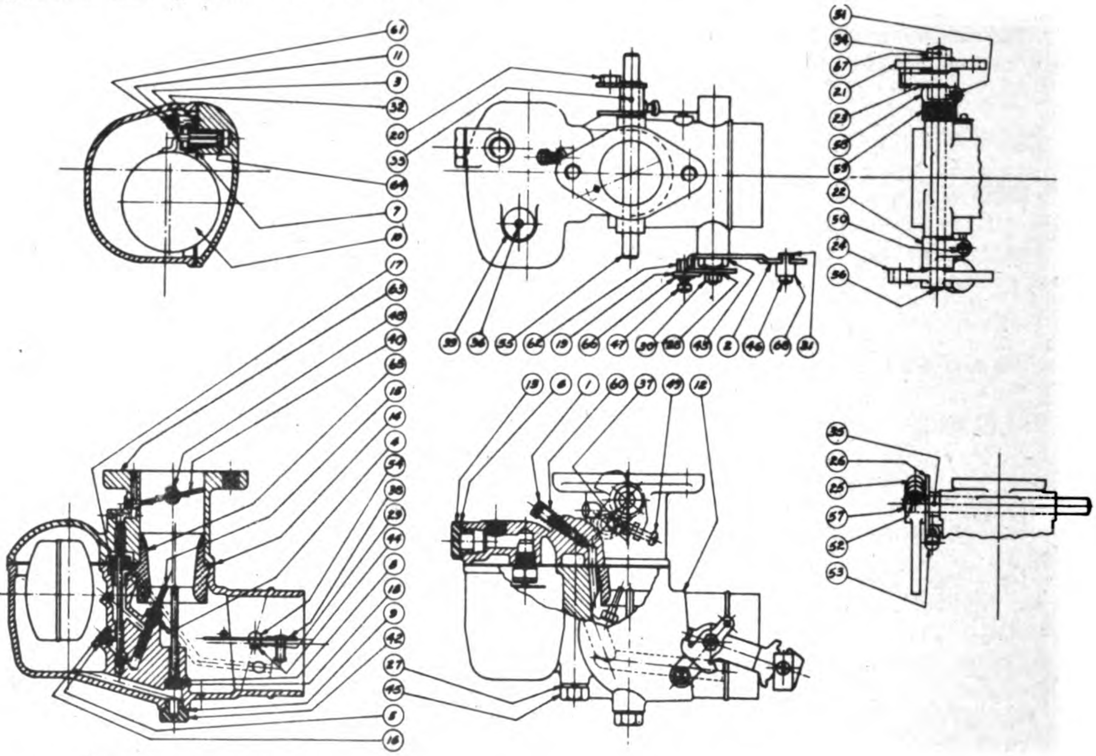
The fuel system should be kept clean and free from both air and gasoline leaks.

2. CARBURETOR:

The construction of this carburetor is shown in the accompanying illustration. The Idling Jet (17) measures the fuel for idling speeds. (The air for idling is regulated by the Idling Adjusting Needle (1). The idling system functions only when the Throttle Plate (40) is almost closed, causing a very strong suction on the priming hole at the edge of the throttle plate.

The Compensating Jet (16) is the source of fuel supply to the idling jet and, as the throttle plate is opened to permit higher engine speeds, the fuel from the compensating jet flows out through the Cap Jet (15). This flow remains constant, even though engine speeds increase, due to the admission of air through ventilation channels.

The Main Jet (18) is the high speed jet and exerts its greatest influence at higher engine speeds. It is a direct suction jet and its flow increases with the flow of air. Its size is determined to give economical operation. Combining the characteristics of this jet with those of the compensating jet you obtain a correctly proportioned mixture. The Venturi (65) is the air metering nozzle and determines the maximum volume which may be passed through the carburetor.



3. OIL-WASHED AIR CLEANER:

This air cleaner is put on the tractor engine to prolong its life and performance by preventing dirt and grit from getting into the engine, causing excessive wear on all operating parts. HOWEVER, THE TRACTOR OPERATOR IS OF NECESSITY CHARGED WITH THE RESPONSIBILITY OF GIVING THE AIR CLEANER EQUIPMENT REGULAR AND CONSTANT ATTENTION IN ACCORDANCE WITH THE INSTRUCTION.

SERVICE AIR CLEANER DAILY. Remove oil cup -- empty oil -- scrape out dirt. Fill to oil level bead with engine oil. Replace oil cup securely. NEVER REMOVE OIL CUP WHILE ENGINE IS RUNNING.

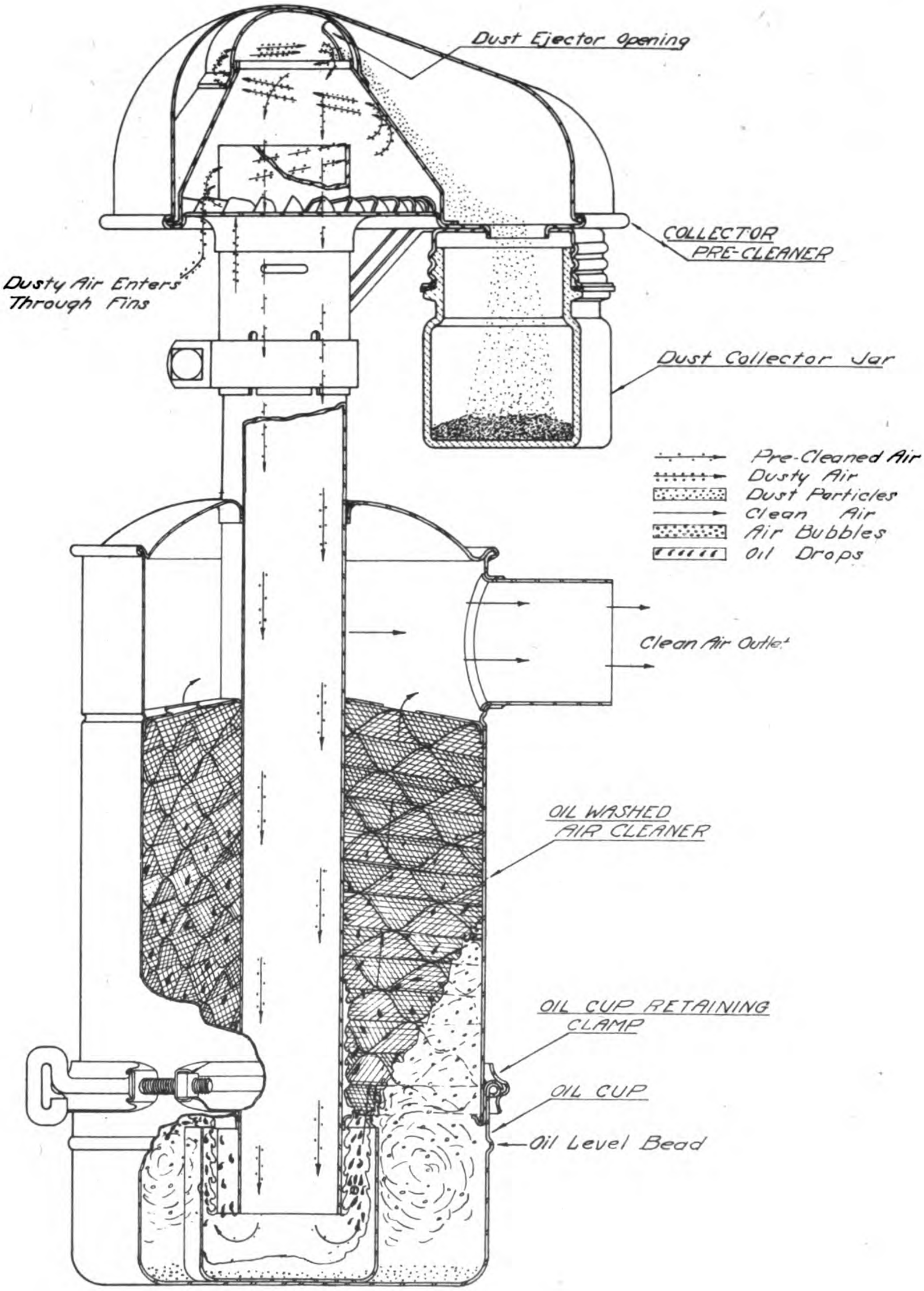
The oil cup should be kept filled as near as possible to the level indicated by the bead with FRESH OIL the same as is used in the crankcase. Never use oil heavier than that used in the engine crankcase.

The best performance of the air cleaner is obtained by keeping the oil level up to the bead on the cup. Raising the oil level above this point DOES NOT increase the efficiency and this practice should be avoided.

It is absolutely necessary to change oil and thoroughly clean the cup whenever the level of dirt accumulated in the bottom of the cup reaches one-half inch, or the oil appears too thick or heavy to spray properly. The depth of dirt at the bottom can be measured with a stick, screw driver, or whatever is convenient. DAILY INSPECTION is necessary to enable the operator to see when any of these conditions have been reached.

FUNCTIONAL DIAGRAM

DONALDSON OIL-WASHED-AIR CLEANER
AND
COLLECTOR PRE-CLEANER



BARBER-GREENE COMPANY, Aurora, Illinois

Ordinarily, if the correct oil level is maintained with the proper grade of oil, the wire screen filtering element will need very little attention. However, the bottom of the screen should be inspected whenever the cup is removed and any accumulation of heavy lint, chaff, leaves or straw removed.

All connections between the air cleaner and carburetor should be inspected at frequent intervals and must be kept tight. SEE INSTRUCTION PLATE ATTACHED TO OIL CUP.

COLLECTOR PRE-CLEANER:

The Donaldson Collector Pre-cleaner is of the dry centrifugal type having a glass Mason jar for a dust receptacle. It is designed to be used in connection with Oil-Type Air Cleaners but not to replace them. The use of the Collector Pre-cleaner results in considerably less dust lodging in the main air cleaner; consequently, it is not necessary for the operator to service the Oil-Type Air Cleaner so frequently. Where dust conditions are extremely severe, the Collector Pre-cleaner is almost indispensable.

As the dusty air passes through the Collector Pre-cleaner, it is given a whirling motion and a large percentage of the dust is thrown out through a slot in the upper inner portion from where it settles into the Mason jar.

SERVICING THE COLLECTOR PRE-CLEANER:

Keep jar screwed on tight.
Empty jar as soon as it becomes about one-half full.
It is not necessary to use any oil in the pre-cleaner jar.

If the glass jar becomes broken, it can be replaced with a standard Mason jar of the same type.

E. Ignition System

1. GENERAL INFORMATION:

The following paragraphs contain complete instructions for timing the engine on the running or operating spark. These recommendations are for average conditions, but should low-grade fuels (62 to 68 octane) be used, knocking may occur under heavy loads, in which case it will be necessary to retard the spark enough to eliminate the knock. If high-grade gasoline (72 to 80 octane), is used, it may be possible to advance the spark.

VALVE TIMING:

Before attempting to time the ignition, be sure the valves are timed correctly. See page 715.

FIRING ORDER:

We give below the firing order for this engine. It should be noted that in this case, the timing gear end or radiator end of the engine is considered the front end. The direction of rotation of this engine is clockwise as determined by facing the front of the engine and noting the direction in which the crankshaft is rotating. The firing order is 1 - 2 - 4 - 3.

IGNITION:

Ignition or spark, to ignite the charge of fuel, is produced by a high tension magneto, The exact time the spark occurs, in relation to the position—

of the piston in the cylinder, is very important. If the spark occurs too soon, the engine will knock, may overheat and be dangerous to crank; whereas, if it occurs too late, the engine will overheat and will not develop its full power.

SETTING FOR SPARK PLUG AND MAGNETO:

Spark plug gaps.	.020" to .030"
Magneto breaker point gaps	.012" to .014"

2. TIMING:

Dead center "D.C." and the timing marks, stamped on the flywheel of the engine, when lined up with the pointer or mark on the top or side of the flywheel housing indicate when the spark should occur in relation to the position of the piston. If the engine is not equipped with a flywheel housing, a metal pointer secured to the cylinder block is furnished. When setting ignition timing, Number 1 piston should be on the compression stroke. To place the piston in this position, make sure the tappet clearance is set as shown on Page 715, rotate the engine in the direction it runs until Number 4 exhaust valve just starts to close. Continue to rotate the engine very slowly until the 30° timing mark is in perfect alignment with the pointer.

3. MAGNETO:

With the engine in the correct position, as outlined in paragraph "Timing", the magneto should then be set to produce the spark at the proper time. Magnetos are usually marked by various means to indicate when the spark will occur for Number 1 cylinder (See instructions following), but if not, proceed as follows: Remove breaker box cover and make certain the breaker point gaps are properly set as shown above. Loosen the adjustable magneto coupling and with the breaker box cover removed, rotate the magneto in the direction in which it is to be run noting when the magneto breaker points just start to separate, which occurs when the fibre bumper or lever begins to bear against the lobe of the cam. Then continue to rotate the magneto passing through the breaker point open position, slightly beyond the point where the contact points close. Then rotate the magneto in the direction it is to run until the breaker points just start to separate. Both the engine and magneto are now in the correct position for firing. If the magneto has no indicator, remove the distributor cap and note to which spark plug cable the spark is to be delivered. Connect this cable to Number 1 spark plug. Complete the installation by connecting the remaining cables to the proper spark plugs. Note the firing sequence of the magneto when connecting the balance of the spark plug cables.

As a final check, rotate the engine slowly to determine where the impulse coupling trips. It should not trip before top dead center "D.C." or later than 5° past top dead center "D.C." The purpose of this coupling is to create a hot spark at cranking speeds and also to automatically retard the spark when starting the engine. After the engine is started, this device automatically becomes inoperative, allowing the spark to occur in the full advance position.

The magneto must be removed from the engine to permit rotating it. When the proper setting has been made and with the engine in the position as outlined in paragraph "Timing", assemble the magneto on the engine by inserting the driven lugs on the magneto coupling into the driving slot in the magneto drive member. If either the governor or the magneto drive member has been removed it may be necessary to line up the drive member slot with the magneto coupling driven lugs. Since the magneto has been properly timed, it should not be rotated, but the adjustment should be made on the magneto drive member. This may be done as follows:

Remove the magneto drive member or governor, and rotate until the driving slot is in line with the driven lugs, then mesh the drive gear. All flange-mounted magnetos have slotted mounting holes to permit the final slight adjustment of the spark by shifting the magneto. When making this adjustment, loosen the mounting screws and retighten after the adjustment has been made.

4. WIRING:

Should it be necessary to remove the spark plug cables from either the magneto or distributor, care should be exercised to make certain they are reassembled on the proper terminals. To do this, refer to the firing order of the engine and then with the engine in the correct position, as outlined in the paragraph "Timing", page 723 the magneto or distributor set as outlined under "Magneto", attach all the spark plug cables to the magneto and then connect them to the proper spark plugs.

5. DETAILS ON MAGNETO

(AMERICAN BOSCH TYPE MJC 4C)

GENERAL DESCRIPTION:

NOTE: The numbers given in the following paragraphs refer to Figures 1, 2, 3, 4, 5. on following pages.

The MJC 4C Bosch magneto employs the induction principle of current generation, the coil windings (10) being stationary and magnets (6) rotated between laminated pole shoes (37). The condenser (48) and interrupter are also stationary. Labyrinth type ventilators (31) are mounted on either side of the magneto housing (1). Magnet rotor ball bearings (2), packed in high temperature American Bosch U.S. 508 grease, require no additional lubrication for at least one year. The distributor gear bearing (16) is of bronze, requiring lubrication only at yearly intervals. A single casting (1), the open end of which is covered by the distributor plate (13), encloses the magneto. An observation window (20) in the distributor plate (13) with a dot (36) on the distributor gear (19) facilitate timing the magneto to the engine.

IT IS UNNECESSARY TO REMOVE THE DISTRIBUTOR PLATE WHEN TIMING THESE MAGNETOS TO THE ENGINE.

INSTALLATION OF MAGNETO:

The magneto, producing an ignition spark only at certain definite points in the rotation of the magnet rotor (6), must be connected to the engine in such a manner that the spark is available always at the instant when required in the cylinder, i.e., about top dead center of the compression stroke, with magneto set in retard position. The magneto, therefore, must be positively driven from the engine by a method that will eliminate slippage; coupling drive is preferable but gear drive may be used.

Provisions have been made, on these types of magnetos, to install our impulse couplings to facilitate starting.

MANUFACTURER'S INSTRUCTIONS:

Where specific instructions are given by the engine manufacturer, it is recommended that they be followed in preference to those herein given.

With the average four or two-cycle engine, the proper operating results are obtained by timing the magneto to the engine, as follows:

Magnetos Equipped with Impulse Coupling:

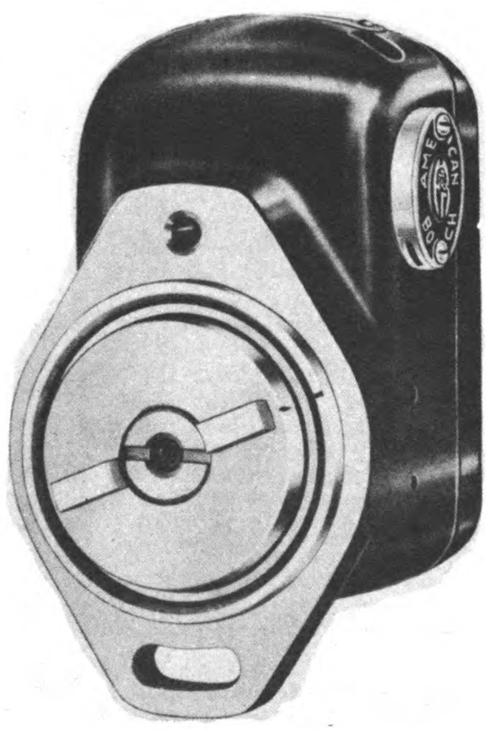
Rotate impulse coupling in the reverse direction of rotation from that indicated on magneto name plate (this is to prevent the engagement of coupling weight) until dot (36) on distributor gear (19) is visible in observation window (20). Line up mark on impulse coupler with mark on coupling housing (see Figure 2). With piston of No. 1 cylinder in firing position of compression stroke, both engine and magneto are in their correct relation for firing and the first magneto spark will be received from the upper right-hand terminal tower (32) which is to be connected to spark plug terminal of No. 1 engine cylinder, which is the one nearest the radiator.

Complete the installation by connecting the remaining cables of the magneto to the spark plugs in proper firing order (generally marked on engine block). The firing sequence on the distributor or high tension end of the magneto follows in the opposite direction of rotation from that indicated by the arrow on the magneto name plate and must be taken into consideration when the cables are connected to spark plugs.

CARE AND MAINTENANCE

LUBRICATION:

Cam lubricating felt wick (41) is saturated with Mobile grease No. 2 at the factory and should be relubricated periodically with a small quantity of S.A.E. 50 or 60 oil. The ball bearings are packed with American Bosch U.S. 508 grease and should be repacked once a year with American Bosch U.S. 508 grease. Extreme care must be exercised so that contact points remain free from oil and grease. When a periodic repair of the engine is undertaken, the magneto should be referred for service to an authorized American Bosch service station.



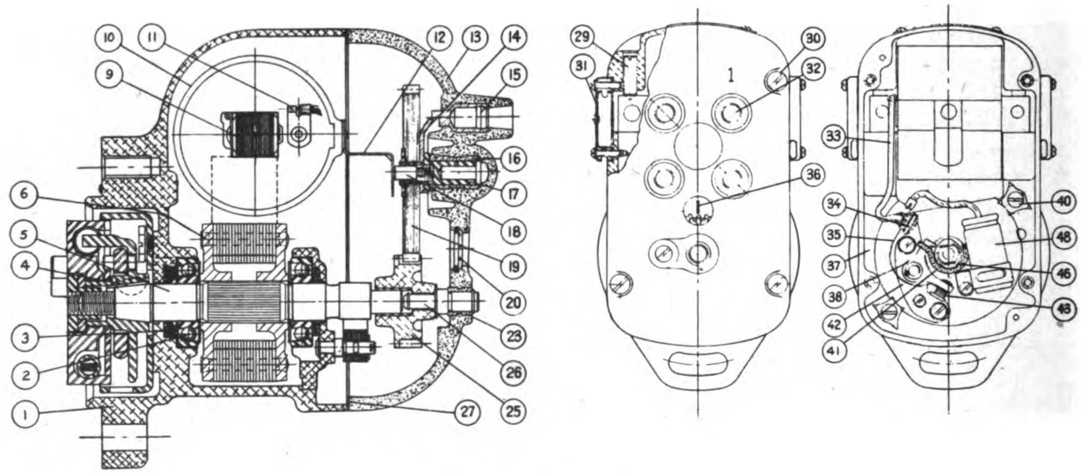
Flange mounted magneto viewed from drive end showing timing marks on coupling.

TROUBLE SHOOTING:

In case of defective ignition, it must first be determined whether the fault is in the magneto, or as is more probable, elsewhere. In general, when only one cylinder misfires, the fault is in the spark plug. The most common plug difficulties are as follows:

PLUG GAP TOO WIDE:

The distance between the electrodes of the spark plug varies according to the individuality of the engine, but normally, this distance should not be less than .02". On the other hand, however, too wide a gap increases the electrical resistance and interferes with the operation of the engine at low speed. Difficulty in starting an engine and missing at low speeds are very often due to the spark plug gaps being too wide, and as the spark will have a tendency to burn the electrodes and thereby gradually increase the gap, it is especially important that the plugs be examined occasionally to see that the gap is not too great; any difficulty due to this cause may be readily overcome by readjusting the electrodes.



NOMENCLATURE

1. Magneto housing
2. Ball bearings
3. Oil seal
4. Woodruff key
5. Magnet rotor shaft
6. Alnico magnet
9. Coil core
10. High tension coil
11. Terminal clip
12. High tension conductor
13. Distributor plate
14. Electrode
15. Cable clip
16. Distributor gear bearing
17. Distributor gear shaft
18. Dist. gear brush & spring
19. Distributor gear
20. Observation window
23. Rotor gear shaft bearing
25. Magnet rotor gear
26. Magnet rotor gear shaft
27. Distributor plate gasket
29. Coil mounting screw
30. Dist. plate fast. screw
31. Ventilator
32. Cable tower
33. Coil cable
34. Insulated bracket
35. Inter. operating spring
36. Line on distributor gear
37. Pole shoes
38. Interrupter lever
40. Inter. holding brkt.screw
41. Cam felt wick
42. Adj. contact bracket
43. Contact points
46. Cam
48. Condenser

PLUG SHORT-CIRCUITED:

This is usually caused by a cracked or porous insulator, or by fouling of the electrodes or insulator. Any of these conditions will cause misfiring by permitting the current to stray from its intended path.

CABLES:

Misfiring of one cylinder, either continuous or intermittent, may be due also to a chafed or broken cable or a loose cable connection. The metal terminals of the cables must not come into contact with any metal parts of the engine or the magneto, except those designated as being correct according to the instruction given.

IRREGULAR FIRING:

If the cables and plugs are in good condition and yet the ignition is irregular, the trouble is probably with the magneto, and the interrupter assembly (40) should be carefully examined. It should be seen that the interrupter lever (38) moves freely and contacts (44) are clean and in correct alignment (see paragraph headed "Interrupter").

DAMAGED INSULATING PARTS:

As it sometimes happens that distributor plate parts of the magneto are damaged through accident or carelessness, these parts should be carefully examined for possible disarrangement or damage which might permit leakage of current.

SERVICE ADJUSTMENTS

INTERRUPTER:

The Tungsten contacts (43) should be adjusted to an opening of 0.016" when the interrupter lever (38) fibre bumper rests on the top of the cam (46). This is done by shifting the adjustable contact bracket (42) until the correct opening has been reached. After adjustment, the bracket (42) must be secured by means of its fastening screw. Contact points (43) must be free from oil or grease and be in proper alignment, so that the full surfaces of both contacts meet squarely. Pitted contacts (43) can be either filed flat or cleaned on a suitable stone. Tool SA 69526, consisting of file and stone neatly packed in wooden container, is recommended for this operation.

When point renewal becomes necessary, always replace both interrupter lever (38) and contact bracket (42) at the same time.

IMPORTANT: Proper methods of removing and replacing the distributor plate assembly to permit either contact point inspection or adjustment.

1. <u>When Magneto is Installed on Engine:</u>
Rotate the engine until the dot (36) on distributor gear (19) and marked tooth of magnet rotor gear (25) are visible in observation window. Remove the four distributor plate fastening screws (30) and withdraw the entire distributor plate assembly. Adjustments can now be made as previously outlined. Extreme care must be exercised that the engine position is not changed.

When replacing the distributor plate assembly, the dot (36) on distributor gear (19) and marked tooth of magnet rotor gear (25) must be visible in observation window. Engage magnet rotor shaft (5) with rotor gear (25) and tighten distributor plate fastening screws (30).

NOTE: If the distributor plate assembly has been removed before the instructions given above were noted, it will be necessary to rotate the engine until piston of No. 1 cylinder, this is the cylinder nearest the radiator, is in approximate firing position of compression stroke. Rotate distributor gear (19) until dot (36) and marked tooth of magnet rotor gear (25) are visible in observation window. Engage magnet rotor shaft (5) with rotor gear (25), slightly moving rotor gear (25) in either direction as required to permit engagement and tighten distributor plate fastening screws (30).

2. When Magneto is Not Installed on Engine:
Remove the distributor plate assembly fastening screws (30) and withdraw the entire assembly. Adjustments can now be made as outlined above. When replacing the distributor plate assembly, the dot (36) on distributor gear (19) and marked tooth of magnet rotor gear (25) must be visible in observation window. Rotate magnet rotor (6) until the large flat of rotor shaft (5) is in top position, facing toward the coil (10). Engage magnet rotor shaft (5) with rotor gear (25) and tighten distributor plate fastening screws (30). Time magneto to engine in accordance with instructions given on previous pages.

MAGNETO REPAIRS:

At least once a year the magneto should be removed from engine and overhauled by an Official Service Station of the American Bosch Corporation. A list of service stations will be sent you upon request. These service stations are equipped with the special tools and testing devices to render quick and efficient service at reasonable charges, and always ready to serve you.

IV. DIS-ASSEMBLY & ASSEMBLY OF LE ROI MODEL D201 ENGINE (Refer to Diagrams in Parts List)

A. Engine Housing

1. Remove Muffler Body (1100).
2. Shut off gasoline filter cock (1054) below gasoline tank.
3. Disconnect fuel line (1057) from gasoline tank and carburetor.
4. Remove hood top strap (1053) by unscrewing 2 screws holding strap to radiator side. Remove 4 capscrews holding hood top (1053) to housing support (1050) and remove hood top.
5. Loosen hose clamps on both ends of air filter connection (552).
6. Disconnect carburetor to hand lever rod (1200).
7. Disconnect oil line to oil pressure gauge (208).
8. Disconnect wire at magneto switch (1126).
9. Disconnect rod to governor speed control if and when used.
10. Drain oil from air cleaner.
11. Remove 5 capscrews on lower part of housing support (1050).
12. Remove housing support (1050).

To re-assemble the housing, reverse the above procedure.

B. Cylinder Head

1. Drain water. Open drain cock (40) on crankcase, carburetor side, also drain cock (1010) located on bottom tank of radiator near water connection to pump.
2. Disconnect choke wire (1125) on carburetor.
3. Disconnect governor rod end (424) and remove carburetor by loosening capscrews on carburetor flange.
4. Unscrew 6 bronze nuts (513), remove manifold (510) and 6 gaskets (511) with retainers.
5. To remove cylinder head cover (310) unscrew 4 - 3/8 nuts.
6. Loosen hose clamp on water connection (670).
7. Unscrew 15 nuts on stud #25, 26 & 27, disconnect oil line (202) and lift cylinder head assembly off the crankcase.
8. To remove rocker arm shaft (280) assembly, unscrew 4 nuts (290), disconnect oil line (253) and lift whole assembly off cylinder head.
9. Remove 8 push rods, (56).
10. Remove rocker arm retainer (287), washer (286), rocker arms, (288) springs (283), and brackets (284), from rocker arm shaft.
11. To remove the valves (230 & 231), press down valve spring cap (236) with the aid of a valve lifter, take out retainer washer (235) and then remove spring (234) with valve spring cap (236). Now remove the safety lock ring (232) from valve stem and push thru valve stem guide (221).

12. The valve stem guide (221) can be pressed out by means of a drift from the crankcase side.

    To re-assembly the head & valve mechanism reverse the above procedure.

    VALVE TAPPET ADJUSTMENT:--See Page 715.

C. Connecting Rod and Piston Etc.

1. Drain the oil thru plug (693) at bottom of pan.
2. Remove oil pan (690) by removing capscrews around oil pan flange.
3. Remove connecting rod cap (101) by first removing cotter pin from connecting rod bolt (103) and unscrewing the nuts (105).
4. Push piston with connecting rod thru top of cylinder to remove from cylinder block.
5. To remove piston from connecting rod, loosen capscrew (111) and drive out piston pin (123).
6. Piston rings may be removed from piston with the aid of a thin flat piece of steel. Do not distort the piston rings.

   To re-assemble reverse the above procedure.

D. Radiator

1. Loosen all water hose connections.
2. Remove capscrews on bottom of radiator and lift off radiator (1000) and radiator packing (1009).

   To re-assemble reverse the above procedure.

E. Water Pump

1. Unscrew 3 capscrews in pump body flange (610) and remove water pump assembly.
2. Loosen 9/16 nuts on fan shaft (616) and pull off fan (659) fan pulley (641) and fan hub (618) as a unit.
3. Remove water pump cover (623), spring (630) and retainer (629).
4. Push out pump shaft (616) towards impeller (621) side of pump.
5. Remove washer (619) and rubber washer (627).
6. Knock out taper pin and press off impeller (621).

   To re-assemble reverse the above procedure.

F. Governor and Magneto Drive

1. Remove magneto.
2. Loosen screws and nuts on governor body (380) and pull out governor assembly.
3. To remove governor shaft (390) assembly, drive out pin (400) with drift placed thru opening in governor body.

4. Remove magneto drive coupling (399) by pushing shaft out toward governor weight (393) side.

5. Drive out governor stop pin (397).

6. Remove thrust bearing (396) and thrust sleeve (395).

7. Drive out taper pin (392) by means of a drift to remove governor drive gear (391).

8. Bushings (381) can be removed by driving out of the body.

To re-assemble reverse the above procedure.

G. Oil Filter

1. Disconnect all oil lines (203 & 204).

2. Unscrew 4 - 5/16 capscrew on supporting clamps.

3. To replace oil cleaner (200) element, loosen screw on top of cleaner and lift off cover.

4. Remove oil cleaner element.

To re-assemble reverse the above procedure.

H. Oil Pressure Relief Valve

1. Remove nut (38) and pull out spring (37) and plunger (36).

To re-assemble reverse the above procedure.

I. Flywheel and Bell Housing

1. Lay crankcase on carburetor side and prop in horizontal position.

2. Remove locking wire (73).

3. Unscrew four capscrews (75).

4. Lift off flywheel (72).

5. Tap pilot bearing (1648) to remove same from flywheel.

6. Drive out 2 taper pins (71).

7. Unscrew 4 capscrews and remove bell housing (70).

To re-assemble reverse the above procedure.

J. Front Engine Support

1. Unscrew capscrews and remove support (85).

2. Remove radiator support (86).

To re-assemble reverse the above procedure.

K. Gear Cover

1. Loosen setscrew (662) on front end of crankshaft (1) and remove fan pulley (661).

2. Unscrew capscrews on outer flange of gear cover (330).

3. Turn nuts on taper pins (354) in clockwise direction for loosening.

4. Remove gear cover and gasket (350).

5. Loosen 4 screws and remove inspection cover (352) and remove governor spring (421).

6. To remove levers (335 and 336) drive out taper pins (335A & 338) by means of a drift, driving from the small end of taper pin.

7. Pull out levers (333 & 337).

To re-assemble reverse the above procedure.

L. Crankshaft

1. Remove locking wires (30) from bearing capscrews (17) loosen screws and remove bearing cap (12, 13, and 14) with shell bearing halves (28,29).

2. Lift out crankshaft and the top halves of shell bearing.

To re-assemble reverse the above procedure.

M. Oil Pump

1. Disconnect oil delivery line (181).

2. Unscrew 2 capscrews on oil pump mounting flange and pull out pump assembly.

3. Remove screen (167) by opening up locking wire.

4. Remove pump cover (165) by unscrewing 6 - screws.

5. Drive out pin (158) to remove helical pump drive gear (157).

6. Pull out pump gears (161) with shaft (156) and the idler gear (164).

To re-assemble reverse the above procedure.

N. Camshaft

1. Pull out camshaft (141) toward gear cover end.

2. Remove camshaft drive gear (142) by unscrewing 3 capscrews.

3. Remove valve tappets (55).

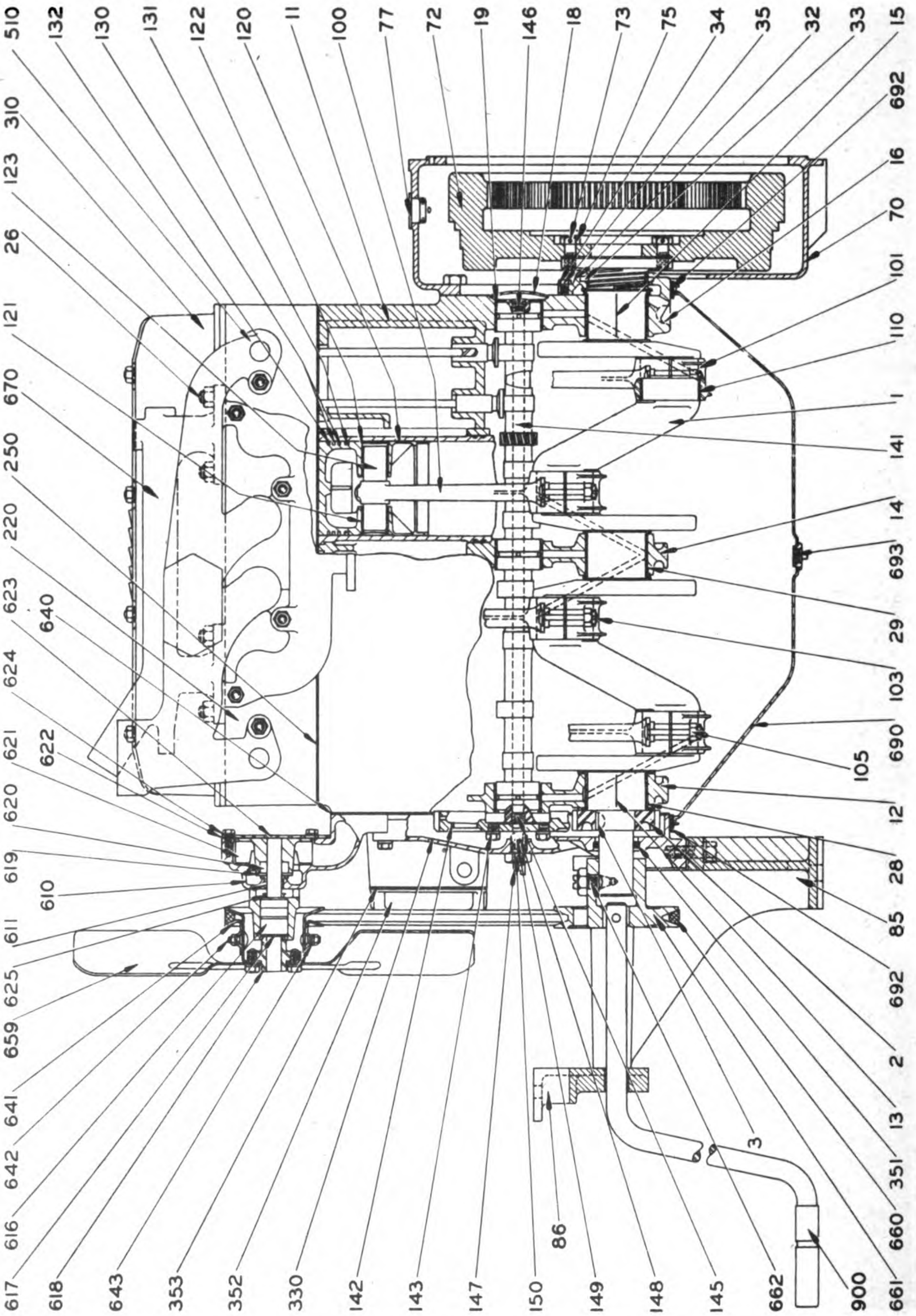
To re-assemble reverse the above procedure.

ENGINE PARTS LIST

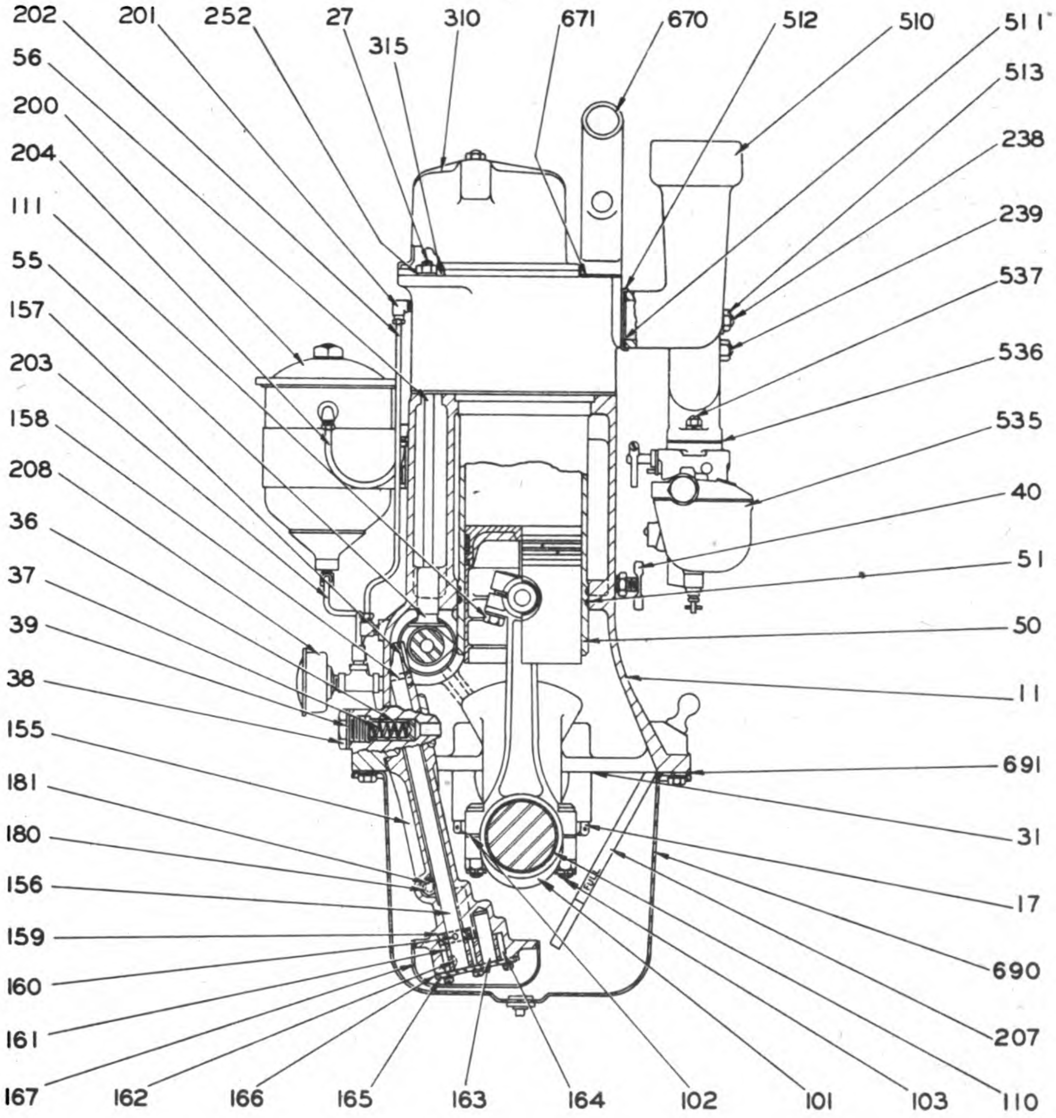
LeRoi Model D201-P3 Gasoline Engine
Barber-Greene Specification No. EN-L-A11

Contents — Page No.

Details of Accessories



LONGITUDINAL SECTION THRU ENGINE



CROSS SECTION THRU ENGINE

Crankshaft Group No. G5-295

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	A5-295	Crankshaft assembly (A to B Incl.)
1.	1	5-295	Crankshaft------------------------------A
2.	1	26-309	Crankshaft gear
3.	1	09-9	Key, Woodruff #8------------------------B

Crankcase Group No. 1G100-174

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	8A100-174	Crankcase assembly (A to D Incl.)
11.	1	100-174	Crankcase--------------------------------A
12.	1	4-113	Front main bearing cap
13.	2	22-141	Front main bearing shim
14.	1	4-114	Center main bearing cap
15.	4	22-140	Center and rear main bearing shim
16.	1	4-115	Rear main bearing cap
17.	6	106-155	Capscrews
18.	1	019-35	Welch plug, 2-1/2" dia.
19.	3	11-149	Camshaft bushing
25.	8	105-198	Cylinder head stud, 1/2 x 4-3/8" lg.
26.	4	105-199	Cylinder head stud, 1/2 x 5" lg.
27.	3	105-264	Cylinder head stud, 3/8 x 4-1/8" lg.
28.	2	21-256	Front main shell bearing
29.	4	21-227	Rear and center shell bearing
30.	3	61-5	Locking wire
31.	2	16-556	Main bearing cap gasket
32.	1	31-299	Rear oil seal retainer
33.	1	31-304	Oil retainer
34.	3	106-156	Oil retainer capscrew
35.	1	61-5	Locking wire
36.	1	25-54	Oil pressure relief plunger
37.	1	24-202	Oil pressure relief spring
38.	1	53-150	Nut for oil pressure relief plug
39.	1	B16-117	Oil pressure relief gasket
40.	1	52-48	Drain cock for water jacket, 3/8"
41.	1	19-59	Cup type plug for dipstick hole
42.	1	011-3	Pipe plug, 3/8" square head
50.	4	175-8-1	Cylinder liner
51.	8	74-61	Packing rings---------------------------D
55.	8	A23-11	Valve tappet
56.	8	99-62	Push rod
58.	1	38-71	Fuel pump plate
59.	1	16-229	Fuel pump plate gasket
	2	02-66	Capscrew for fuel pump plate, 5/16" - 18 x 1/2" hex.

Bell Housing - Front Support Group No. 3G37-138

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
70.	1	37-138	Bell housing, #4
	2	02-70	Capscrew for bell housing to engine, 1/2" - 13 x 1-1/4" hex.
	2	02-76	Capscrew for bell housing to engine, 1/2" - 13 x 2-3/4" hex.
	4	05-53	Lockwashers, 1/2"
71.	2	010-131	Taper pin, #9
	1	A9-359	Flywheel assembly (72 and 76)
72.	1	9-359	Flywheel
76.	1	26-282	Ring gear
73.	1	61-5	Locking wire, #14 x 11" lg.
75.	4	106-153	Capscrew for flywheel, 1/2 x 1" lg.
77.	1	14-86	Timer opening cover
	2	03-619	Timer opening cover screw, 1/4" - 20 x 1/2" rd. hd.
78.	1	14-472	Starter hole cover
	3	02-32	Starter hole cover capscrews, 3/8" - 16 x 1/2" hex.
	3	05-51	Lockwashers, 3/8"
	3	04-405	Jam nut, 1/2" - 13 USS
85.	1	39-703	Front engine support
	1	02-44	Front engine support capscrew, R.H. 3/8" - 16 x 3" hex.
	1	02-36	Front engine support capscrews, L.H. 3/8" - 16 x 1" hex.
	2	05-51	Lockwashers, 3/8"
	2	02-72	Capscrews, 1/2" - 13 x 1-3/4" hex.
	2	05-53	Lockwashers, 1/2"
86.	1	39-705	Radiator support
	2	02-54	Radiator support capscrews, 7/16" - 14 x 1" hex.
	2	05-52	Lockwashers, 7/16"

Connecting Rod - Piston Group No. 1G7-61

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	4	10A7-61	Connecting rod assembly (A to C Incl.)
100.	4	7-61	Connecting rod---------------------------A
101.	4	4-146	Connecting rod cap
102.	16	22-139	Shim, .004
103.	8	35-21	Connecting rod bolt
105.	8	53-152	Connecting rod bolt nut, hex.------------B
110.	8	21-246	Connecting rod shell bearing
	4	05-51	Lockwashers, 3/8"
	8	07-23	Cotter pin, 3/32 x 1" lg.
111.	4	34-110	Piston pin bolt--------------------------C
	4	1A8-223	Piston assembly (D to E Incl.)

Connecting Rod - Piston Group No. 1G7-61 (Continued)

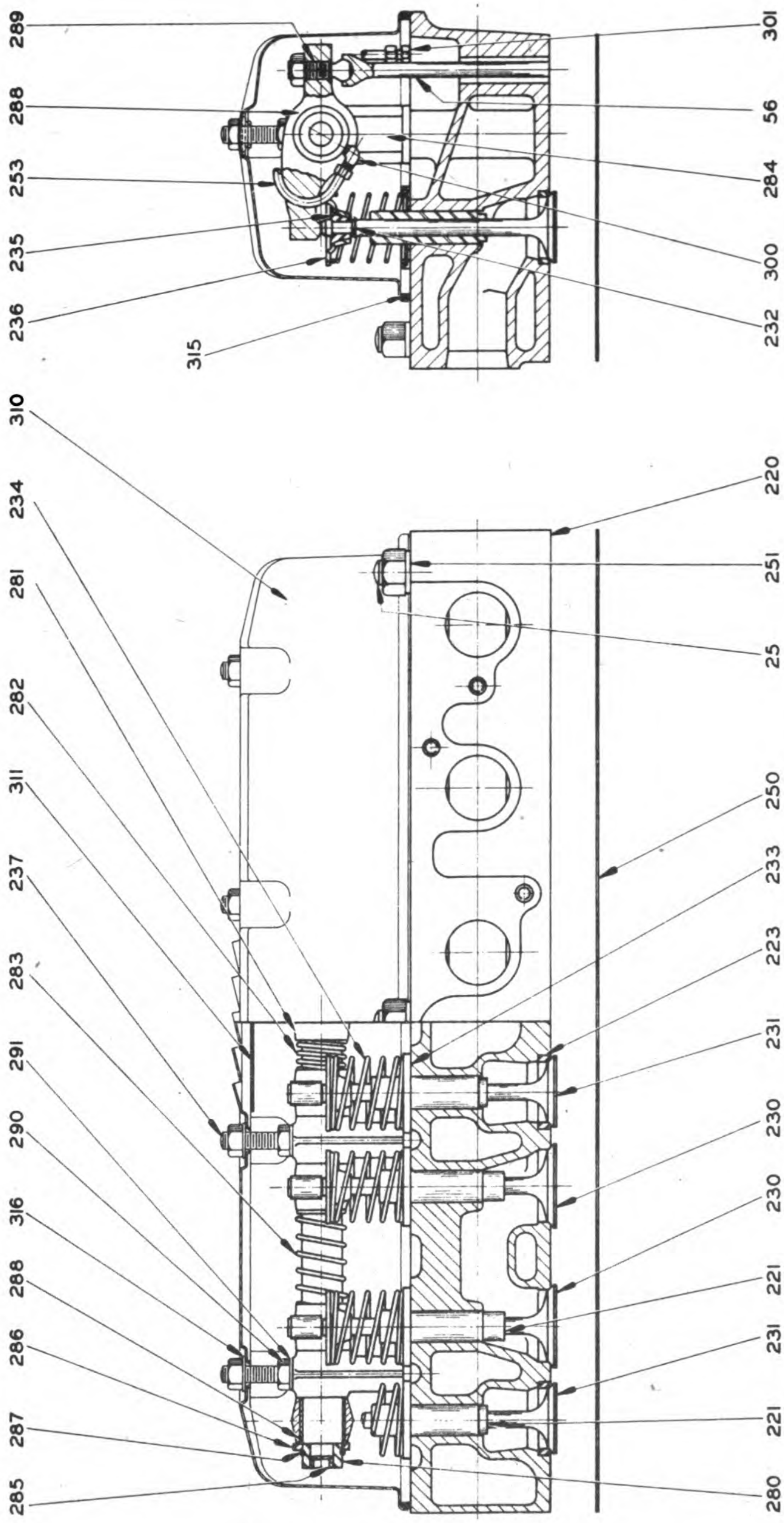
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
120.	4	8-223	Piston 4" dia. 4.87 to 1 compr. ratio---D
121.	4	11-118	Piston bushing
122.	4	11-119	Piston bushing
123.	4	17-285	Piston pin------------------------------E
130.	8	18-188	Piston ring, PC #70, .010" - .020" gap
131.	4	18-189	Piston ring, PC #85, oil, .010" - .018" gap
132.	4	18-143	Piston ring, PC reg., .010" - .020" gap

Camshaft Group No. 1G6-143

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
141.	1	6-143	Camshaft
142.	1	26-310	Camshaft gear
143.	3	106-158	Hex. capscrew, 3/8" x 13/16"
	3	05-51	Lockwasher, 3/8" SAE
144.	1	61-5	Lock wire, 1/16" x 8" lg.
145.	1	19-42	Camshaft thrust plug
146.	1	011-103	Pipe plug, 3/8" MPT, ctrsk.

Lubricating System No. 5G13-242

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	1A13-242	Oil pump body assembly (A to C Incl.)
155.	1	13-242	Oil pump body----------------------------A
156.	1	27-802	Shaft
157.	1	26-312	Helical drive gear
158.	1	17-289	Drive gear dowel pin, 3/16 x 1"
159.	1	29-80	Thrust collar
160.	1	17-290	Thrust collar dowel pin, 3/16 x 1"
161.	1	26-313	Pump gear
162.	1	09-2	Key for pump gear #2 Woodruff
163.	1	27-803	Idler shaft
164.	1	26-314	Idler gear
165.	1	14-510	Pump cover
	6	03-92	Fillister head screw, #10-24 x 1/2"
	6	05-5	Lockwasher, #10
166.	1	16-569	Cover gasket
167.	1	43-66	Screen
169.	1	61-301	Locking wire, screen, 14-1/4" lg.--------C
	2	02-20	Hex. capscrew, 5/16 - 18 x 1"
	2	05-50	Lockwasher, 5/16"
180.	2	A182-20	Fitting, 7/16" tube x 1/4" P.T.
	2	182-8	Nut for fitting, 7/16" tube
	1		Tube from oil pump delivery, 7/16 x 6-13/16"



CYLINDER HEAD ASSEMBLY

Lubricating System No. 5G13-242 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
200.	1	A77-206	Oil filter, Purolator #N1540 (See page 823 for breakdown)
	4	06-3	Plain washer, 5/16"
	4	05-50	Capscrew, 5/16 - 18 x 1" hex.
201.	4	A182-32	Elbow fitting, 3/16 x 18" MPT x 90°
	1		Tubing from crankcase to cylinder head, 3/16" x 11-1/2"
	1		Tubing from crankcase to filter, 3/16 x 10"
	1		Tubing from filter to push rod chamber, 3/16 x 7"
205.	2	A182-12	Straight fitting, 3/16 x 1/8" P. thd.
	6	182-2	Nut for elbow & straight fitting, 3/16" tube
207.	1	A60-43-53	Dipstick
208.	1	60-33	Oil pressure gauge
210.	1	A73-253-11	Flex. hose assembly, 1/8 x 21" lg.
212.	1	11-188	Dipstick bushing
213.	1	4-152	Dipstick cap

Cylinder Head Group No. G2-146

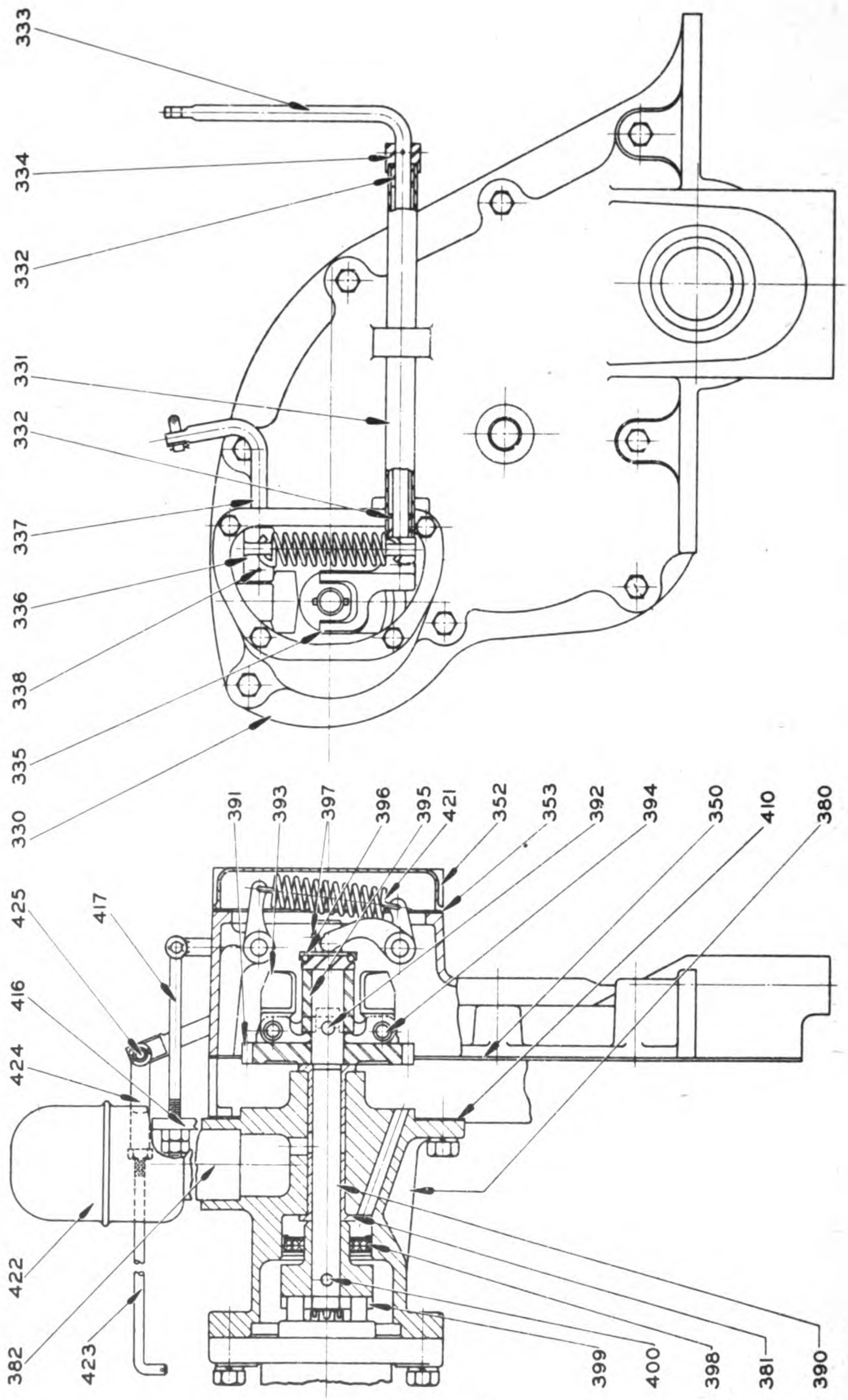
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	6A2-146	Engine cylinder head assembly (A to C Incl.)
	1	3A2-146	Engine cylinder head assembly (A to B Incl.)
220.	1	2-146	Engine cylinder head------------------------A
221.	8	58-32	Valve stem guide
222.	6	19-43	Core hole cup plug
223.	4	64-31	Exhaust valve seat insert-----------------B
230.	4	15-157	Intake valve
231.	4	15-158	Exhaust valve
232.	8	64-36	Safety lock ring
233.	8	20-232	Valve spring seat washer
234.	8	24-259	Valve spring
235.	16	20-233	Valve spring retaining washer
236.	8	20-231	Valve spring cap washer
237.	4	105-200	Rocker arm bracket stud, 3/8 x 4-1/2"
238.	2	105-204	Manifold stud, 3/8 x 3-1/2"
239.	4	105-42	Manifold stud, 3/8 x 4-3/8"---------------C
250.	1	16-571	Cylinder head gasket
251.	12	20-282	Hardened washer, 1/2"
	12	04-705	Hex. nut, 1/2" - 20 (Hardened)
252.	3	20-309	Hardened washer, 3/8"
	3	04-703	Hardened hex. nut 3/8" - 24
253.	1	55-370	Oil tube 3/16 x 7-3/16" lg.
	1	2A27-799	Rocker arm shaft assembly (D to G Incl.)
280.	1	27-799	Rocker arm shaft-----------------------------D
285.	2	19-44	Rocker arm shaft end plug
281.	1	29-78	Oil collar
282.	2	24-206	Center spring for rocker arm shaft
283.	2	24-204	Spacing spring for rocker arm shaft

Cylinder Head Group No. G2-146 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
284.	4	40-768-1	Rocker arm shaft bracket
286.	2	20-227	Rocker arm shaft end washer
287.	2	31-305	Rocker arm retainer
	8	2A98-35	Rocker arm assembly (F to G Incl.)
288.	8	A98-35	Rocker arm assembly
	8	04-603	Nut, 3/8" - 24 hex.
289.	8	106-159	Adjusting screw--------------------------G
290.	4	53-216	Nut, 3/8" - 24
291.	4	20-347	Washer, 3/8"
300.	1	A182-32	Elbow fitting, 3/16 x 1/8" MPT x 90°
	1	182-2	Nut for elbow fitting, 3/16" tube
	1	A14-506	Cylinder head cover assembly (H and J)
310.	1	14-506	Cylinder head cover----------------------H
311.	2	43-83	Screen-----------------------------------J
315.	1	16-562	Cork gasket
316.	4	20-271	Copper washer, 3/8"
	4	04-603	Nut, 3/8" - 24 hex.

Gear Cover Group No. G14-508

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	A14-508	Gear cover assembly-----------------A to C
330.	1	14-508	Gear cover-------------------------------A
331.	1	55-372	Tube for governor cross shaft
332.	2	11-124	Bushing for cross shaft tube
339.	2	105-201	Magneto stud, 3/8 x 2-3/4"
	1	A106-160	Thrust screw assembly for camshaft
332 a.	1	106-160	Thrust screw
332 b.	1	24-246	Thrust spring
332 c.	1	25-69	Camshaft thrust plunger
332 d.	1	17-331	Pin
	1	04-957	Jam nut for thrust screw, 5/8" - 11
333.	1	27-804	Governor cross shaft
334.	1	29-79	Collar for governor cross shaft
335.	1	48-316	Governor thrust lever
	2	010-9	Taper pin, #0 x 3/4"
336.	1	48-317	Speed control spring lever
337.	1	48-318	Governor speed control lever
338.	1	010-9	Taper pin, #0 x 3/4"--------------------C
350.	1	16-566	Gasket for gear cover
	5	05-51	Lockwasher, 3/8"



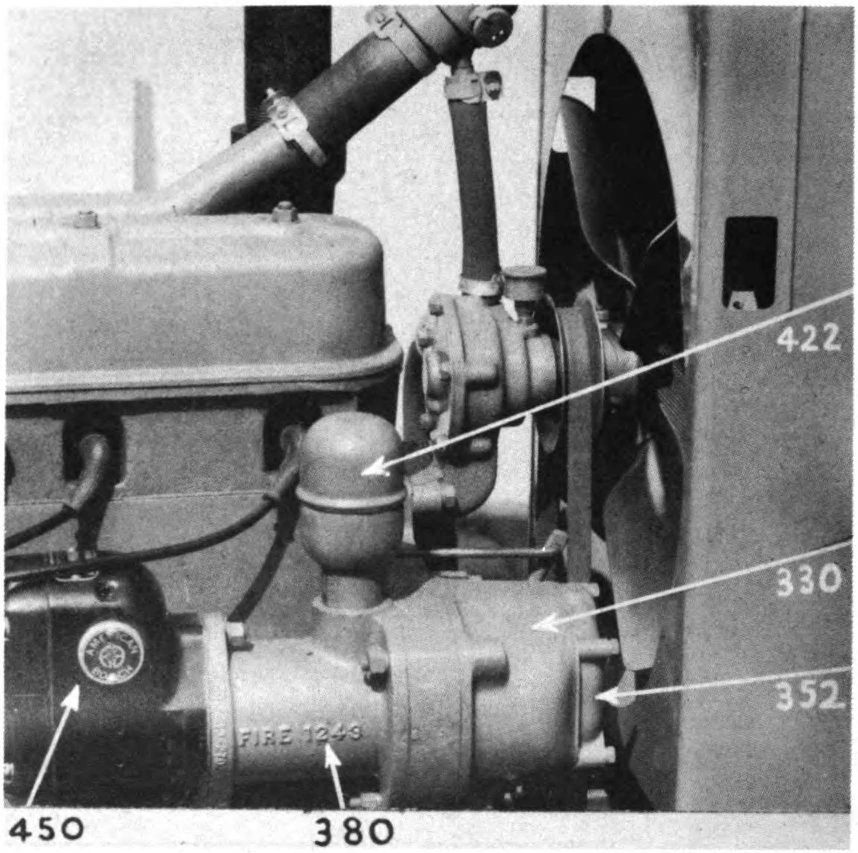
GOVERNOR ASSEMBLY

Gear Cover Group No. G14-508 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	4	02-39	Hex. capscrew, 3/8" - 16 x 1-3/4"
	1	02-41	Hex. capscrew, 3/8" - 16 x 2-1/4"
351.	1	125-26	Oil seal, Chicago Rawhide, 1-1/2" dia.
352.	1	14-509	Inspection cover
353.	1	16-568	Gasket for inspection cover
	4	05-49	Lockwasher, 1/4"
	4	02-7	Hex. capscrew, 1/4 x 1-1/4"
354.	2	010-315	Taper pin, #7 x 2" lg.
	2	04-603	Hex. nut, 3/8" - 24

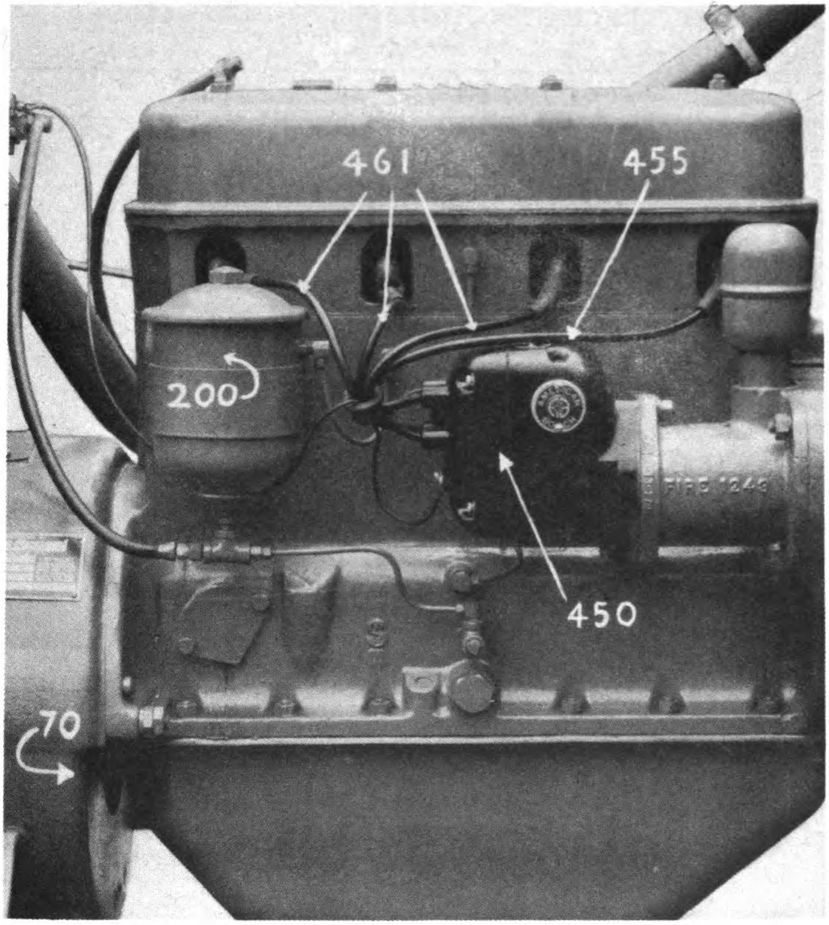
Governor Group No. 3G13-270

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	7A13-270	Governor body assembly (A to E Incl.)
380.	1	A13-270	Governor body----------------------------A
381.	2	11-122	Bushing
382.	1	49-43	Filler tube
390.	1	27-856	Governor shaft
391.	1	26-330	Governor and mag. drive gear
392.	1	010-56	Taper pin
393.	2	44-37-1	Weight (1400 and over)
394.	2	17-301	Weight pin
395.	1	63-48	Thrust sleeve
396.	1	181-17	Thrust brg., N.D. #H0202
397.	1	B17-13	Governor stop pin
398.	1	125-29	Oil seal, Chicago Rawhide
399.	1	28-157	Coupling
400.	1	17-310	Pin, 1/4 x 2-1/8"
427.	1	19-59	Cup plug for gov. body, 9/16"------------E
410.	1	16-567	Gasket for gov. body to crankcase
	3	05-51	Lockwashers, 3/8"
	1	02-37	Capscrews, 3/8 - 16 x 1-1/4" hex.
	2	02-41	Capscrews, 3/8 - 16 x 2-1/4" hex.
421.	1	24-228	Gov. spring (1400 and over)
422.	1	A49-44-1	Breather cap
	1	A47-337	Gov. operating rod assem. (F to G Incl.)
423.	1	47-337	Gov. operating rod----------------------F
	1	04-601	Rod nut, 1/4" - 28 hex.
424.	1	031-2	Rod end----------------------------------G
425.	1	031-62	Rod end pin
	2	07-3	Cotter pin, 1/16" x 1/2" lg.
426.	1	24-260	Gov. operating spring



Ignition System No. 11G85-126

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
450.	1	A85-126	Fixed flange magneto, Bosch MJC4C-302 includes Impulse Coupling (see page 820 for breakdown).
452.	2	B105-8	Magneto stud, 3/8 - 16 x 1-11/16" lg.
453.	2	53-180	Magneto stud nut, 3/8" - 16
	2	05-51	Lockwasher, 3/8"
	1	2A61-1-14	Wire assembly (A to B Incl.)
455.	1	61-1-14	Wire for spark plug, 16" lg.------------A
456.	1	121-63	Spark plug and terminal
457.	1	121-14	Magneto and terminal to #1 plug----------B
	3	A61-1-42	Wire assembly (C to D Incl.)
461.	3	61-1-42	Wire for spark plug----------------------C
462.	3	121-63	Spark plug and terminal
463.	3	121-14	Magneto and terminal to #2, 3, 4 plugs---D
480.	1	150-1	Grommet
481.	4	124-2	Spark plug insulator
482.	1	62-36	Ignition wire tag, #1
483.	1	62-36-1	Ignition wire tag, #2
484.	1	62-36-2	Ignition wire tag, #3
485.	1	62-36-3	Ignition wire tag, #4
500.	4	86-8	Spark plug, A. C. Type 46
1126.	1	A76-42	Ground switch clum #13967
	1	A61-10-13	Wire assembly (E and F)
1147.	1	61-10-13	Wire, #16B x 33" lg.---------------------E
1148.	2	121-5	Terminal---------------------------------F



Manifold Group No. 1G10-302

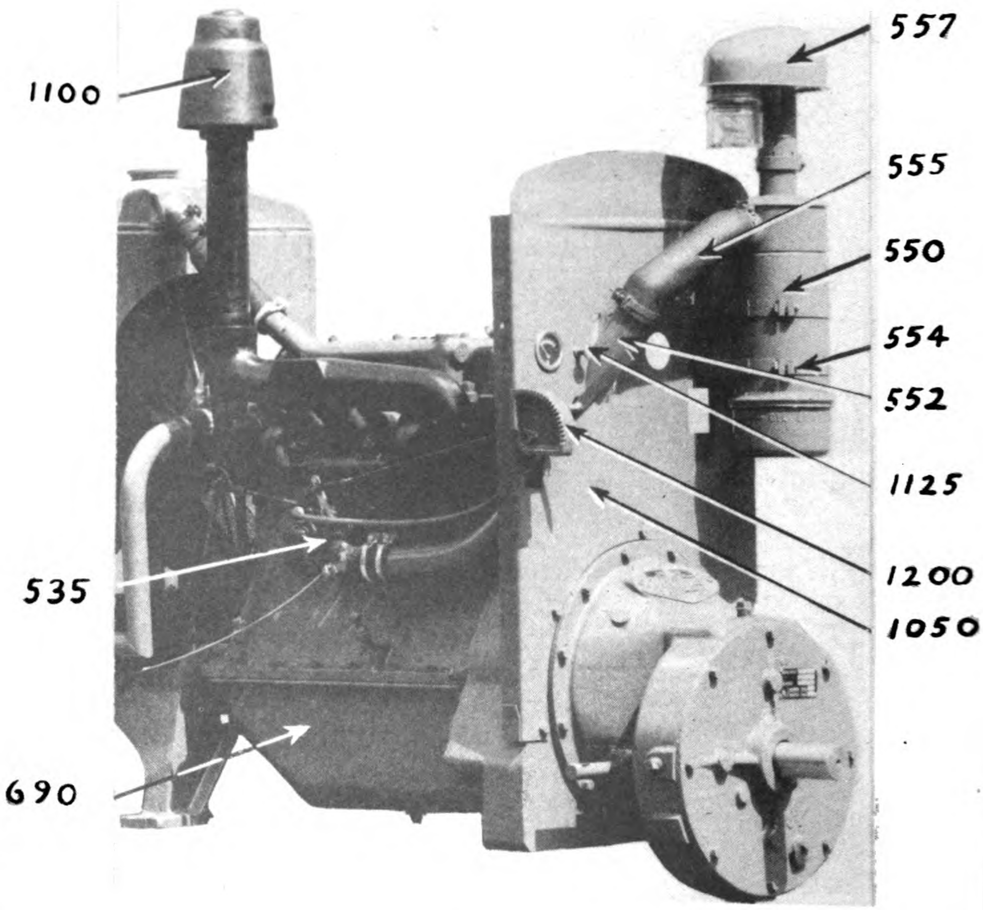
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
510.	1	10-302	Intake and exhaust manifold
511.	6	16-520	Intake and exhaust manifold gasket
512.	6	31-287	Gasket retainer
513.	6	53-144	Bronze nut
	6	06-69	Plain washers, 3/8"

Fuel System No. 2G84-331-1

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
535.	1	A84-331-1	Carburetor, Zenith #124-1/2 TO - Outline #S-676 (See page 822 for breakdown)
536.	1	16-694	Carburetor gasket
537.	2	105-2	Carburetor stud
538.	2	53-29	Nut for stud
	2	05-50	Lockwashers, 5/16"
550.	1	A77-211	Donaldson oil bath air filter, #A5329 (See page 824 for breakdown)
552.	1	65-354	Air filter connection
554.	2	A89-104	Air filter clamp

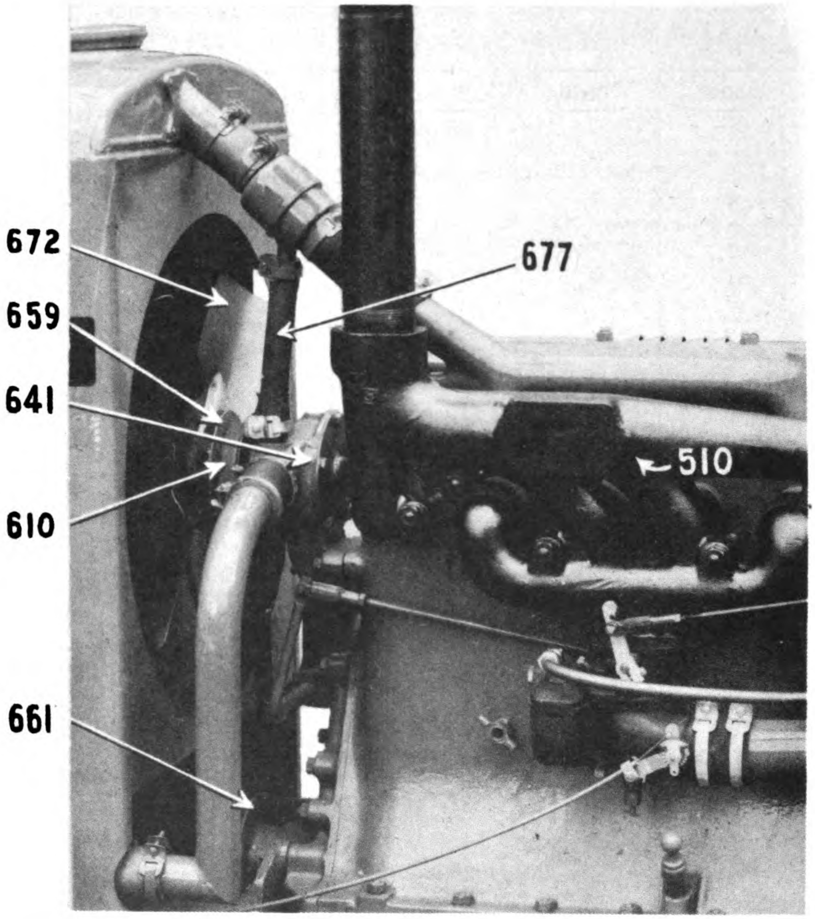
Fuel System No. 2G84-331-1 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	4	02-4	Air filter clamp capscrews, 1/4 - 20 x 3/4" hex.
	4	05-49	Lockwashers, 1/4"
	4	04-101	Nuts, 1/4" - 20 hex.
555.	1	73-1-15	Hose for air filter connection
	4	79-34	Hose clamps
	8	79-35	Hose clamp ends
	4	03-96	Hose clamp screws, #10-24 x 1" lg.
	4	04-13	Hose clamp nuts, #10-24
557.	1	A43-133	Donaldson pre-cleaner #1537-A, Collector type (See page 824 for breakdow
558.	1	65-487	Hose for air filter to connection
1125.	1	A120-2	Choke, Clum #8974



Cooling System No. 9G81-175

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	1A81-175-1	**Water pump body assem. (A to C Incl.)**
610.	1	A81-175-1	Water pump body---------------------------A
611.	2	11-141	Bushings
616.	1	27-1342	Pump shaft
618.	1	132-103	Fan hub
619.	1	20-248-1	Fibre washer
621.	1	101-27	Impeller
622.	1	16-792	Water pump cover gasket
623.	1	14-823	Water pump cover
624.	2	20-97	Copper washer
	5	02-1	Capscrew, 1/4" - 20 x 3/8" lg.
	1	010-56	Taper pin, #4 x 1-3/4" lg.
626.	1	17-303	Pin
	1	04-606	Nut, 9/16" - 18 hex.
	1	04-1108	Palnut, 9/16" SAE
	1	017-11	Grease cup, 1/8" P. Thread
627.	1	20-247	Rubber washer
628.	1	09-6	Woodruff key, #6------------------------C
640.	1	16-564	Water pump body gasket
	3	02-38	Capscrew, 3/8 - 16 x 1-1/2" hex.
	3	05-51	Lockwasher, 3/8"
641.	1	1A36-234	Fan pulley assembly
	3	02-38	Capscrew for water pump body, 3/8" - 16 x 1-1/2" hex.
	3	05-51	Lockwasher, 3/8"
659.	1	42-67	Fan, 17" dia. - 4 blade
	4	02-18	Capscrew for fan blade, 5/16" - 18 x 3/4" hex.
	4	05-50	Lockwashers, 5/16"
660.	1	41-146	Fan belt "V" type
661.	1	36-235	Crankshaft pulley
662.	1	106-157	Fan pulley setscrew
	1	04-407	Nut, 5/8" - 11 hex. jam
670.	1	12-354	Water connection
671.	2	16-563	Water connection gasket
672.	1	116-74	Thermostat, Dole, Model PAN
676.	1	33-51-26	Pipe nipple, 3/8 x 1-1/2" lg.
	1		Hose, 5/8 x 7" lg.
	4	79-35	Hose clamp
	8	79-34	Hose clamp end
	4	03-96	Hose clamp screw, #10-24 x 1" rd. hd.
	4	04-13	Hose clamp nuts, #10-24 hex.
	1		Hose, 1-3/8" x 2-1/2" lg.
1000.	1	A71-380	Radiator with cap 4-105
	1		Engine to radiator hose, 1-3/8" x 4" lg.
	1	73-26-2	Water pump to radiator hose, 1-1/2 x 2" lg.
1008.	1	65-492	Radiator connection
	12	79-34	Hose clamp end
	6	79-35	Hose clamp
	6	03-96	Hose clamp screw, #10-24 x 1" lg.
	6	04-13	Hose clamp nut, #10-24
1009.	2	74-7	Radiator packing
	2	02-70	Capscrew, 1/2 - 13 x 1-1/4" hex.
	2	05-53	Lockwashers, 1/2"
1010.	1	52-48	Drain cock



Oil Pan Group No. 2G3-172

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
690.	1	3-172	Oil pan
691.	2	16-558	Oil pan gasket
692.	2	16-557	Front and rear bearing cap gasket
	11	02-20	Capscrews, 5/16" - 18 x 1" hex.
	2	02-22	Capscrews, 5/16" - 18 x 1-1/2" hex.
	4	02-18	Capscrews, 5/16" - 18 x 3/4" hex.
	17	05-50	Lockwashers, 5/16"
	14	04-102	Nuts, 5/16" - 18 hex.
693.	1	19-85	Magnetic drain plug

Starting Crank Group No. G50-54

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
900.	1	50-54	Starting crank

Housing Fuel Tank Group No. 1G39-1065-8

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1050.	1	39-1065-8	Housing support for flywheel end
	5	02-16	Capscrew for support, 5/16 - 18 x 1/2" hex.
	5	05-50	Lockwashers, 5/16"
	1	3A68-641-2	Hood top assembly (A to C Incl.)
1051.	1	68-641-2	Hood top---------------------------------A
	6	03-621	Round head machine screws, 1/4 - 20 x 3/4"
	6	05-49	Lockwashers, 1/4"
1052.	1	A69-265	Gasoline tank----------------------------B
1052 a.	1	39-1237	Gasoline tank support
	2	03-623	Round head machine screws, 1/4 - 20 x 1-1/4"
	2	04-18	Square nut, 1/4" - 20
1052 b.	1	16-882	Packing
1052 c.	2	83-26	Gasoline tank strap----------------------C
1053.	1	89-105	Strap for hood top
	2	03-633	Hood top screws, 5/16" - 18 x 2" button head
	2	05-50	Lockwashers, 5/16"
	4	02-18	Capscrew for hood top and support, 5/16" - 18 x 3/4" hex.
	4	05-50	Lockwashers, 5/16"
	4	04-102	Nuts, 5/16" - 18 hex.
1054.	1	A77-22	Gasoline filter, Tillotson, #OW-418 (See page 825 for breakdown)
	1	013-1	Close nipple, 1/8"
1057.	1	73-253	Flexible hose assembly
1057 a.	1	83-61	Clamp for flexible hose line
	1	03-1546	Parker Kalon screw, #10 x 5/8" lg.
1058.	1	68-387	Left hand hood side
1080.	1	68-387-1	Right hand hood side
	1	013-5	Street ell, 1/8", gasoline line

Muffler Group No. 1G78-43

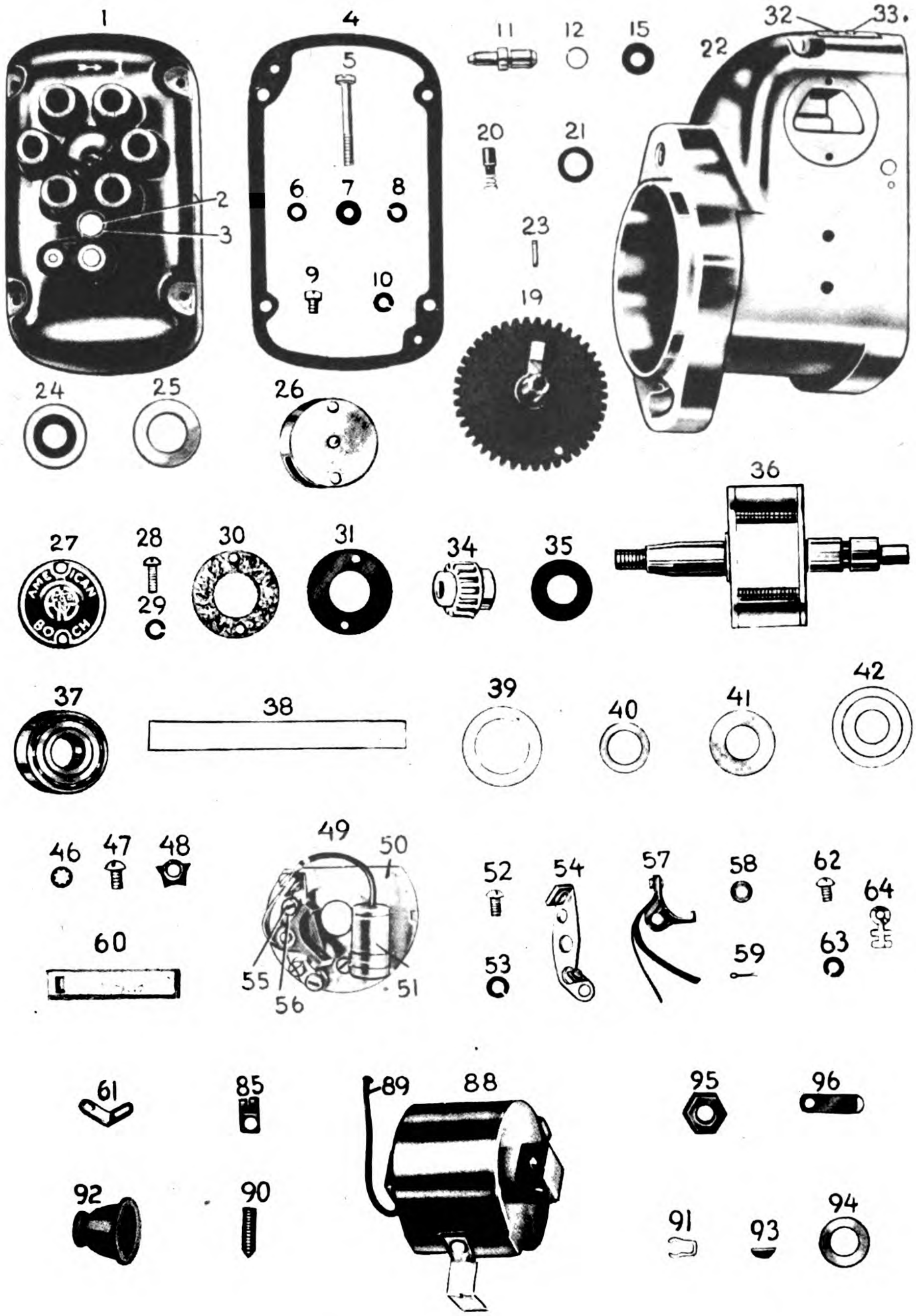
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	1A78-43	Muffler assembly (A to C Incl.)
1100.	1	78-43	Muffler body-----------------------------A
1101.	1	55-568	Muffler body tube
1102.	1	011-106	Pipe plug, 1" ctrsk.---------------------C
1103.	1	33-86-20	Muffler exhaust pipe, 2 x 11-1/4" lg.

Throttle Group 4G40-819

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1200.	1	40-819	Throttle control bracket
1300.	1	47-370	Carburetor to hand lever rod
	1	06-67	Plain washer, 9/32" I.D.
	1	07-3	Cotter pin, 1/16 x 1/2" lg.
	2	02-20	Capscrew for bracket, 5/16 - 18 x 1" hex.
	2	04-102	Nut, 5/16" - 18 hex.
	2	05-50	Lockwasher, 5/16"
1301.	1	031-2	Rod end yoke
1302.	1	031-62	Rod end pin, 1/4"
	1	07-3	Cotter pin, 1/16 x 1/2" lg.
1308.	1	27-1321	Control shaft
1310.	1	010-202	Taper pin, #00 x 3/4" lg.
1311.	1	48-368	Lever
1312.	1	48-330	Hand throttle lever
1313.	1	24-104	Hand throttle lever spring
	3	07-21	Cotter pin, 3/32 x 3/4" lg.
	3	06-69	Plain washer, 3/8"

DETAILS OF ENGINE ACCESSORIES

Type MJC4C-302 MAGNETO



Details of Engine Accessories (Continued)
Magneto - Bosch No. MJC4C-302
- LeRoi Co. No. A85-126

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
* 1	1	DP 52231	Distributor plate - fixed
2	1	WN 521	Observation window
3	1	RG 5210	Ring for window
* 4	1	GA 524	Distributor plate gasket
* 5	4	SC 1037 CA	Fastening screw for distributor plate
6	4	WA 98922	Plain washer under fastening screw
7	4	WA 5280	Sealing washer under fastening screw
8	4	WA 288	Lockwasher under fastening screw
9	1	SC 24-4 CA	Magneto grounding screw
10	1	WA 288	Grounding screw lockwasher
11	1	SD 5249	(Rotor gear shaft - fixed)
12	1	SP 1021	Shaft spring ring - distributor plate end - fixed
12	1	SP 5254	Shaft spring ring - gear end
15	1	WA 1070	Rotor gear spacing washer
* 19	1	GE 5282	Distributor gear
* 20	1	BR 529	Carbon brush and spring in distributor gear
21	1	WA 528	Distributor gear spacing washer
22	1	HG 5221	Magneto housing - flange-mounted - drilled for coupling
23	2	PN 1001	Distributor plate locating pin
24	1	PK 521	Leather oil seal - drive end (for flange mounting only)
25	1	WA 1071	Washer under oil seal
26	2	CV 52126	Ventilator cover
27	2	NP 5222	Name plate on ventilator cover
28	4	SC 37-8 CA	Cover fastening screw
29	4	WA 6-3 CA	Lockwasher under fastening screw
30	2	GA 5215	Gasket under cover
31	2	WA 5281	Washer under gasket
32	1	NP 521	Name plate for type designation
33	2	SC 121-4 CA	Screw for plate
34	1	GE 5238	Rotor gear - clockwise
* 35	1	WA 81751	Rotor felt washer
36	1	RT 5294	Magnet rotor
* 37	2	BB 60226	Ball bearing - either end
* 38	2	IS 504	Packing strip for ball bearing
39	2	IS 222	Paper washer for ball bearing
40	as req'd	WA 61	Bearing shim (.0126")
40	as req'd	WA 106	Bearing shim (.0071")
40	as req'd	WA 107	Bearing shim (.0040")
40	as req'd	WA 1009	Bearing shim (.0197")
41	2	WA 1034	Bearing spacing washer
42	1	WA 5245	Rotor felt retaining washer
46	2	WA 21-5	Shakeproof washer under fastening screw
47	2	SC 41-8 CA	Fastening screw under interrupter bracket
48	2	PL 52125	Locking plate for fastening screw
49	1	BK 5258	Interrupter assembly complete with bracket
50	1	BK 5259	Interrupter bracket with riveted parts only
* 51	1	CW 5232	Condenser
52	1	SC 39-5 CA	Fastening screw for condenser and wick retaining bracket
53	1	WA 5-4	Lockwasher for fastening screw
* 54	1	BK 566	Contact bracket with point
55	2	SC 39-5 CA	Fastening screw for contact bracket

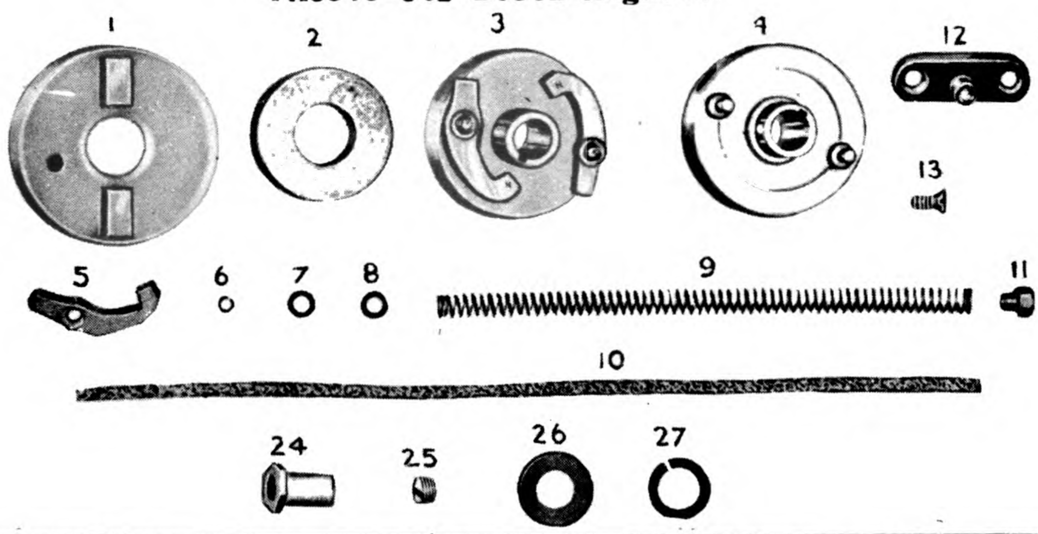
* Fast Moving Parts

Details of Engine Accessories (Continued)
Magneto - Bosch No. MJC4C-302
- LeRoi Co. No. A85-126 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
56	2	WA 21-4 CA	Lockwasher under fastening screw
* 57	1	LE 5236	Interrupter lever with point and springs
58	1	WA 1012	Plain washer for lever stud
59	1	PN 1007	Interrupter lever cotter pin
60	1	WK 5231	Cam Oiler Wick
61	1	BK 5283	Retaining bracket for wick - fixed only
62	1	SC 37-5 CA	Fastening screw for conducting lead
63	1	WA 6-3 CA	Lockwasher under fastening screw
64	1	EC 1012	Terminal clip for cable
85	1	EC 5224	Terminal clip for coil cable
* 88	1	CL 5238	High-tension coil complete
* 89	as req'd	KL 100657	Coil cable - specify length
* 90	2	SC 1060	Lock screw for mounting coil
91	4	FP 81953	Clip for distributor plate cable
92	4	IS 82927	Rubber insulation nipple
93	1	KY 1004	Woodruff key - used with coupling
94	1	WA 2	Plain washer for rotor shaft
95	1	NT 67446	Hexagon nut for rotor shaft
96	1	GG 522	Gauge for contact point setting

* Fast Moving Parts

Impulse Coupling #1CA-2A2-35° For #MJC4C-302 Bosch Magneto



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	CA 739	Cam
	1	HB 7328	Coupling plate and hub assembly
	1	*HG 73120	Housing - for clockwise rotation
	1	NT 731	Round nut for rotor shaft
	1	*PK 734	Felt wick for spring
	1	PL 7370	Arrester plate
	2	*PN 731	Pin for spiral spring
	2	SA 65972	Weight
	1	*SC 732	Screw for fastening arrester plate
	1	*SP 736	Spiral spring
	1	WA 5-16	Lock washer under rotor shaft nut
	1	WA 1116	Lock washer under arrester plate fastening screw

Details of Engine Accessories (Continued)

Carburetor - Zenith Model 124-1/2 TO - Outline #S-676
LeRoi Co. Part No. A84-331-1

REF. NO.	NO. REQ.	PART NO.	DESCRIPTION
	1	B2-54E	Throttle body assembly
	1	D8497-1	Throttle lever & stop assembly
	1	C23-267	Throttle shaft
	1	T1S8-10	Throttle lever stop screw
	1	CT63-2	Throttle lever taper pin
	2	C136-3	Throttle plate screw
	1	C21-12	Throttle plate
	1	C46-23	Idle adjusting needle
	1	C111-14	Idle adjusting needle spring
	1	C88-12	Float hinge bracket
	2	T73-9	Bracket drive screw
	1	C85-65	Float assembly
	1	A3-23	Fuel bowl assembly
	1	C117-32	Float spring
	1	C120-35	Float axle
	1	C71-9	Main jet adjustment assembly #18
	1	T56-23	Adjustment assembly washer
	1	C140-33	Assembly bolt
	1	T43-103	Assembly bolt lockwasher
	1	C-142-27	Bowl to body gasket
	1	C138-42	Gas connection plug
	1	T56-10	Gas connection plug washer
	1	CT91-1	Bowl drain plug
	1	C101-2	Air shutter assembly
	2	T15B6-4	Air shutter screw
	1	C105-19	Air shutter shaft
	1	C106-2	Air shutter lever assembly
	1	C109-2	Air shutter bracket assembly
	1	CR134-1	Air shutter lever swivel 3/32" Dr.
	1	C140-2	Bracket assembly screw
	1	T22S8	Air shutter shaft nut

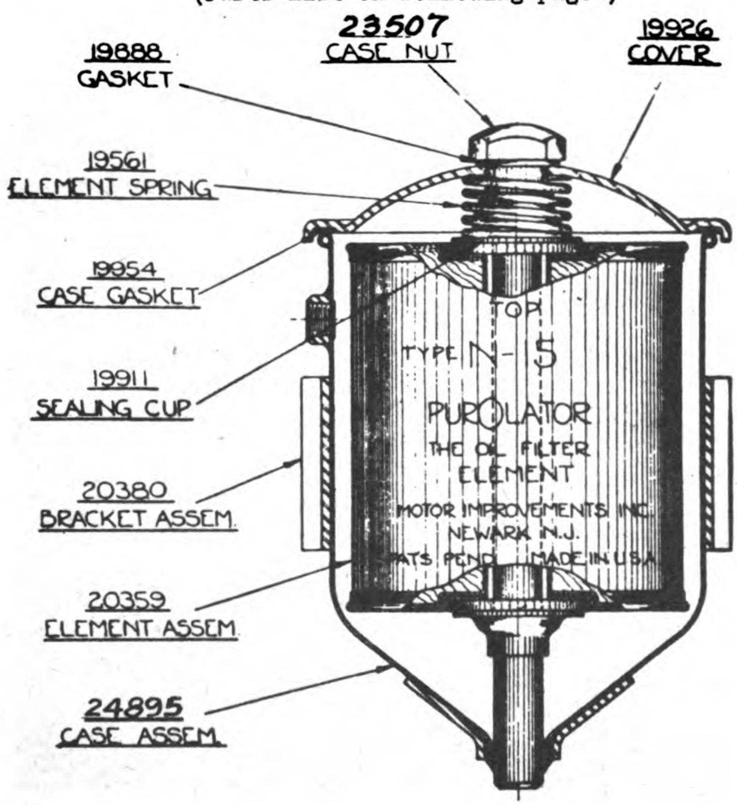
Details of Engine Accessories (Continued)
Carburetor - Zenith Model 124-1/2 TO - Outline #S-676 - LeRoi Co. Part No. A84-331-1 (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	T45-8	Air shutter shaft lockwasher
	2	T43-6	Air shutter screw lockwasher
	1	C38-39	Venturi #19
	1	C51-15	Main Jet #19
	1	T56-24	Main jet washer
	1	C52-3	Compensating jet #20
	1	T56-24	Compensating jet washer
	1	C54-14	Idling jet #12
	1	C54-13	Cap jet #18
	1	T56-24	Cap jet washer
	1	C81-26	Fuel valve and seat assembly #44
	1	T56-23	Fuel valve seat washer
	1	C24-23x3	Floating lever assembly
	1	T8S8-7	Air shutter lever swivel screw
	1	CT52-1	Swivel washer

When ordering parts for carburetor specify Model and Outline Number.

Oil Filter - Purolator No. N-1540 - LeRoi Co. No. A77-206

(Parts list on following page.)



Details of Engine Accessories (Continued)

Oil Filter - Purolator No. N-1540
- LeRoi Co. No. A77-206 (Continued)

NO.REQ.	PART NO.	DESCRIPTION
1	20359-1	N-15 Element Assembly
1	24895-1	Case Assembly
1	23506-1	Cover Assembly
1	19926-2	Case Cover
1	19911	Sealing Cup
1	19561	Element Retaining Spring
1	23507	Cover Retaining Nut
1	19888	Retaining Nut Gasket
1	20380	Bracket Assembly
1	20381	Mounting Bracket
2	19565	Stove Bolt and Nut
2	10344	Lockwasher
1	19954	Cover Gasket

Air Cleaner - Donaldson No. A-5329
- LeRoi Co. No. A77-211

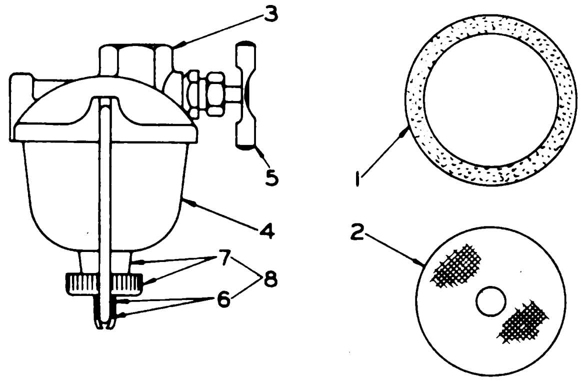
NO.REQ.	PART NO.	DESCRIPTION
1	P-3224	Body Assembly
1	P-2859	Oil Cup Assembly
1	P-2706	Cup Clamp Assembly
1	P-2690	Clamp Bolt

Pre-Cleaner - Donaldson No. 1537-A
- LeRoi Co. No. A43-133

NO.REQ.	PART NO.	DESCRIPTION
1	X-1537	Pre-Cleaner only
1	P-2734	Gasket
1	P-2647	Jar
1	P-4543	Clamp

Details of Engine Accessories (Continued)

Gasoline Strainer - Tillotson No. OW-418
- LeRoi Co. No. A77-22



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	OW-418	Strainer Assembly Complete
1	1	OW-222	Gasket, cork, bowl to cover
2	1	OW-352	Screen
3	1	OW-361	Cover, Female inlet connection
3	1		Cover, Male inlet connection
4	1	OW-363	Bowl, Glass, Gasoline sediment
5	1	OW-432	Cock, Gasoline shut-off
6	1	OW-446	Clamp Assembly, Wire
7	1	OW-462	Thumb Wheel and Cup Assembly
8	1	OW-447	Thumb Wheel, Cup and Clamp Assembly

NUMERICAL INDEX
ACCESSORY SECTION

"No. Req." is total for the entire parts list.

Prices subject to change without notice.

Part No.	Page	No. Req.	Unit Price
1.03	652	2	.01
1.06-1	652	1	.02
1.16	652	1	.01
S1.16	652	1	.02
1.26E	652	1	N/C
1.58	652	2	.01
1.74	652	1	.02
S1.167B	652	1	.01
S1.183	652	1	.01
A1-333-V-464	616	1	24.80
A1-3236-K-635	620	1	2.60
A1-3236-L-636	620	1	2.60
2-1	652	1	1.00
2X-19	616	2	.03
2X-26	620	4	.07
02-36	604	21	.04
02-38	604	1	.04
A2-333-V-464	616	1	24.80
3-1-13	618	2	12.50
3-1-14	618	2	12.50
3-5-7	618	2	5.25
3-7-14	618	4	2.15
03-620	604	2	.01
S4-61	652	1	.02
T4-3-4-4	618	4	3.80
T4-3-10-4	618	8	.75
T4-3-11-5	618	2	2.00
T4-3-13-5	618	4	.65
T4-3-26-2	618	2	1.00
T4-3-55-1	618	8	1.15
T4-3-56-1	618	4	.02
T4-3-57-1	618	12	.02
T4-3-58-1	618	8	.02
04-605	604	4	.02
5.43	652	1	.06
5.75	652	2	.02
05-49	604	4	.01
05-51	603	29	.01
	604		
05-53	604	4	.01
5X-180	620	4	.05
5X-267	616	2	.32
5X-433	620	2	.07
M7.341	652	1	.24
T8-17-24-1	616	2	.70
CB9.05-2	652	1	3.16
CB9.10	652	1	.16
CB9.11	652	1	.06
09-15	604	1	.02
CB9.20	652	1	.72
C9.22	652	1	.03
C9.37	652	1	.02
CB9.29	652	1	.24
CB9.50	652	1	.40
CB9.51	652	1	.20
CB9.54	652	1	.08
CB9.55	652	1	.02
CB9.57	652	2	.02
CB9.60	652	1	.24
CB9.61	652	1	.02
CB9.62	652	1	.20
CB9.63	652	1	.02
09-172	604	1	.08
CB9.185	652	1	.04
CB9.335	652	1	.02
AA10.45	652	1	.36
CB10.528	652	1	.72
CB10.530-1	652	1	1.32
CB10.540-1	652	1	1.68
CB10.540C	652	1	3.00
CB10.540D	652	1	3.36
CB11.18	652	1	.02
CA11.21	652	1	.20
CA11.42	652	1	.06
F11.51	652	1	.20
F11.52	652	1	.02
F11.53	652	1	.12
CA11.76	652	2	.04
012-1	604	4	.01
13X-9	616	12	.07
13-33-11	604	1	18.00
14-36	604	1	.24
14-37-2	604	1	6.00
16-94	604	1	.16
017-1	604	2	.08
17X-177	619	64	.03
19-84	604	2	.45
20X-37	616	12	.37
20X-38	616	12	.37
20-47	604	1	.04
F-24	630	1	
26-20	604	1	20.00
26-21	604	1	6.00
27-59	604	1	1.40
27-812	604	1	6.00
27-1208	604	1	11.00
C-29	628	1	
31-14	604	1	.50
34-178	603	8	.16
37-13	604	1	14.00
F-45	630	1	
45-9	604	1	2.25
53-193	604	1	.10
61-5	604	1	.02
C-62	628	1	
62-5	604	1	.12
62-57-1	604	1	.14
62-75	604	1	.10
C-63	630	1	
C-64	630	1	
66-9	604	1	.40
A73-252-1	604	1	1.20
91-4	604	1	.08
103-F	604	4	.55
105-16	604	4	.08
106-8	604	4	.04
106-41	604	1	.08
106-A	603	4	.12
112-B-10	603	2	1.20
115	604	1	.06
M-115	603	12	.01
116-B-10	603	1	2.90
O-116-B-10	703	1	5.20
117-C-8-S	604	1	2.50
118-113	604	1	3.20
119-B-2	604	8	.20
125-6	604	1	1.00
F-131	630	1	
F-151	630	1	
181-37	603	1	2.10
181-48	604	1	5.50
181-61	604	1	4.20
182-52	604	1	.28
F-193	630	1	
C-262	630	3	
F-265	630	1	
S-359	618	8	.30
X-361	620	2	.05
414	616	2	1.56
419	616	2	
X-527	620	4	.005
X-528	616	14	.005
	620		
X-529	616	2	.005

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Unit Price	Part No.	Page	No. Req.	Unit Price
552-A	616	2	3.70	202696	610	1	.28
560-S	616	2	4.97	202697	610	1	.23
M-641	603	4	.01	202698	610	1	.49
M-642	604	8	.01	202699	610	1	.11
M-645	604	2	.03	202735	610	1	.11
M-649	604	2	.04	202736	610	1	.19
739	618	8	.25	202737	610	1	.11
X-740	620	2	.12	202738	610	1	.23
N-767-A	618	8	.10	202741	610	1	.41
X-1015	620	4	.03	202743	610	1	.19
A-1069	603	6	.11	202744	610	1	.11
1107-C-29	616	2	.06	202746	610	1	5.22
1199-J-114	616	6	.32	202747	610	1	.11
1199-K-115	616	6	.32	202869	610	1	.19
1199-M-117	616	6	.18	202982	610	4	.004
1199-N-118	616	6	.18	202985	620	16	.01
1199-A-625	619	4	.90	203016	610	1	.01
1199-B-626	620	4	.11	203145	620	16	.02
1205-K-193	620	4	.06	203151	620	16	.02
1205-M-273	616	2	.21	203227	610	1	.02
A-1205-M-273	616	2	1.04	203379	610	1	1.09
1205-N-274	616	2	.11	203388	610	4	.08
1205-N-274A	616	2		203575	620	3	.02
1218-M-13	620	4	.06	203680	622	1	.04
1225-F-266	619	4	.13	204055	610	1	.75
1227-X-102	616	4	.40	204056	610	1	.15
1228-A-53	620	2	.72	204568	610	1	6.56
1229-R-122	620	2	.05	204650	610	1	.98
1229-T-462	616	2	.07	204651	610	1	.19
1229-M-559	620	2	.07	205948	620	1	.75
1229-J-712	616	2	.26	210812	620	1	2.66
1229-Q-771	620	2	.05	211567	610	1	.11
1229-E-837	620	2	.11	211537	610	1	.23
1229-H-866	620	2	.05	211538	610	1	.41
1229-J-868	620	2	.04	211539	610	1	.23
1246-S-227	620	4	.52	211541	610	1	.30
1259-L-90	620	4	.90	211542	610	1	.15
X-1545	616	12	.02	211595	610	1	.30
X-1609	620	4	.02	212135	610	1	.68
X-1815	620	2	.03	212303	620	2	.34
X-1876	620	48	.04	212357	622	1	.01
1968A	604	8	.11	212550	620	1	.38
1990	603	1	3.63	212628	622	1	1.10
2137	604	1	3.85	212629	622	1	1.91
2208-H-216	616	2	.07	212630	622	1	.24
2240-V-906	619	4	3.10	212631	622	2	.19
2240-W-907	619	4	2.65	212632	622	4	.01
2245	604	1	.24	212633	622	1	.04
2258-P-328	620	2	.29	213086	622	1	4.47
A-3211-Z-832	620	2	16.75	213224	610	1	.02
A-3219-T-1294	616	2	22.80	213225	610	1	1.58
A-3222-J-400	619	4	21.85	213226	610	1	.11
3262-A-53	616	2	.40	213227	610	1	.12
3286-T-20	616	2	.58	213228	610	1	.11
3299-Y-493	620	2	2.60	213229	610	1	.04
B-5282-B	608	1	.04	213230	610	1	.30
5747	603	1	6.70	213387	610	1	.08
5752	603	1	5.40	213530	608	1	.19
A-5862	608	1	.30	214134	608	2	.71
A-5864	608	1	.15	214169	608	1	7.43
A-5865	608	1	.23	214172	608	1	2.70
O-6837-V	606	1	9.94	214173	608	1	.21
O-6838-V	608	2	2.89	214174	608	2	.26
SB-9900-B	618	2	26.00	215204	610	1	5.93
11725	620	4	.004	216071	610	1	9.90
B-12694	606	1	1.16	217843	620	1	4.32
C-55100	606	1	2.92	220001	620	1	1.84
T-11025-N	616	1	116.90	220304	610	1	2.62
A-135441	608	1	1.20	220305	610	1	3.75
A-135834	608	1	1.68	220829	610	1	20.21
A-135835	608	1	.18	221053	608	1	1.88
200029	610	1	.08	BBGX3C	608	1	.53
201271	620	1	1.35	BCBX1BD	608	1	.08
201318	620	2	.004	BFAX2CF	608	2	.08
201326	622	1	.08	BL-RC-D1-1	628	1	50.60
201327	622	1	.02	BL-RC-D1-2	628	1	44.00
201687	620	1	.30	BL-RC-D1-3	628	2	26.40
202690	610	1	.34	BL-RC-D1-4	628	1	46.20
202691	610	1	1.31	BL-RC-D1-5	628	1	46.20
202692	610	1	.53	BL-RC-D1-6	628	2	19.25
202693	610	1	1.61	BL-RC-D1-7	628	1	11.00
202695	610	1	.26	BL-RC-D1-8	628	1	13.20

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Unit Price
BL-RC-D1-9	628	4	6.05
BL-RC-D1-10	628	4	.99
BL-RC-D1-11	628	1	.99
BL-RC-D1-12	628	1	.99
BL-RC-D1-13	628	1	9.63
BL-RC-D1-14	628	1	9.63
BL-RC-D1-15	628	1	.99
BL-RC-D1-16	628	1	.99
BL-RC-D1-17	628	1	4.68
BL-RC-D1-18	628	1	4.68
BL-RC-D1-19	628	1	.22
BL-RC-D1-20	628	4	1.49
BL-RC-D1-22	628	2	.06
BL-RC-D1-23	628	1	.11
BL-RC-D1-24	628	1	.39
BL-RC-D1-25	628	1	.11
BL-RC-D1-26	628	1	.11
BL-RC-D1-27	628	1	.11
BL-RC-D1-28	628	2	.11
BL-RC-D1-30	628	1	11.00
BL-RC-D1-31	628	1	With #30
BL-RC-D1-32	628	6	With #30
BU-AE-A1-1	651	1	5.50
BU-AE-A1-2	651	1	6.50
BU-AE-A1-3	651	1	.10
BU-AE-A1-5	651	1	.35
BU-AE-A1-6	651	1	.35
BU-AE-A1-7	651	1	.25
BU-AE-A1-8	651	1	2.75
BU-AE-A1-9	651	1	.60
BU-AE-A1-9G	651	1	.60
BU-AE-A1-11	651	1	.65
BU-AE-A1-12	651	1	2.50
BU-AE-A1-14a	651	1	.50
BU-AE-A1-15	651	1	.40
BU-AE-A1-16	651	1	.40
BU-AE-A1-17	651	1	.05
BU-AE-A1-18	651	1	.20
BU-AE-A1-19	651	1	.05
BU-AE-A1-20	651	1	.15
BU-AE-A1-21	651	1	.25
BU-AE-A1-23	651	1	.35
BU-HA-F1-1	631	1	15.00
BU-HA-F1-2	631	1	18.50
BU-HA-F1-3	631	1	2.00
BU-HA-F1-4	631	1	15.00
BU-HA-F1-5	631	1	2.25
BU-HA-F1-6	631	3	.10
BU-HA-F1-7	631	1	2.50
BU-HA-F1-8	631	1	1.10
BU-HA-F1-9	631	2	.05
BU-HA-F1-10	631	1	1.75
BU-HA-F1-11	631	1	1.95
BU-HA-F1-12	631	1	.45
BU-HA-F1-13	632	1	.10
BU-HA-F1-14	632	1	.10
BU-HA-F1-15	632	1	.75
BU-HA-F1-16	632	2	.05
BU-HA-F1-17	632	1	.50
BU-HA-F1-20	632	1	.05
BU-HA-F1-21	632	1	.10
BU-HA-F1-22	632	1	.05
BU-HA-F1-23	632	1	5.00
BU-HA-F1-24	632	1	With #23
FA-CL-A1-1	626	1	59.67
FA-CL-A1-2	626	1	27.62
FA-CL-A1-3	626	1	.26
FA-CL-A1-4	626	1	18.79
FA-CL-A1-5	626	1	18.79
FA-CL-A1-6	626	1	4.14
FA-CL-A1-7	626	2	16.58
FA-CL-A1-9	626	1	11.05
FA-CL-A1-10	626	1	27.62
PN-PD-A1-126	608	1	.08
PN-PD-A1-127	608	1	.01
PN-PD-A1-128	608	1	.01
PU-AM-A1-1	644	1	12.60
PU-AM-A1-2	644	1	15.40
PU-AM-A1-3	644	1	1.40
PU-AM-A1-4	644	1	13.30
PU-AM-A1-5	644	1	4.55
PU-AM-A1-8	644	1	1.40
PU-AM-A1-9	644	2	.07
PU-AM-A1-10	644	2	.21
PU-AM-A1-12	644	1	.21
PU-AM-A1-13	644	1	4.20
PU-AM-A1-17	644	1	.21
PU-AM-A1-18	644	8	.56
PU-AM-A1-19	644	1	.14
PU-AM-A1-22	644	1	1.61
PU-AM-A1-33	644	1	1.40
PU-AM-A1-35	644	1	2.80
PU-AM-A1-36	644	1	.14
PU-AM-A1-37	644	4	.14
PU-AM-A1-38	644	1	.14
PU-K-E1-1	637	1	29.25
PU-K-E1-2	637	1	8.74
PU-K-E1-2a	637	1	8.01
PU-K-E1-3	637	1	3.85
PU-K-E1-3a	637	1	3.85
PU-K-E1-4a	638	1	1.78
PU-K-E1-5	638	2	8.30
PU-K-E1-7	638	2	5.64
PU-K-E1-8	638	2	3.54
PU-K-E1-9	638	1	7.93
PU-K-E1-10	638	54	.06
PU-K-E1-11	638	2	.03
PU-K-E1-21	638	4	.08
PU-K-E1-22	638	3	.12
PU-VK-C-1	633	1	1.54
PU-VK-C-2	633	1	7.70
PU-VK-C-3	633	1	18.50
PU-VK-C-4	633	1	.93
PU-VK-C-5	633	1	2.16
PU-VK-C-6	633	1	1.54
PU-VK-C-7	633	1	.31
PU-VK-C-8	633	1	.15
PU-VK-C-9	633	1	.31
PU-VK-C-10	633	1	1.54
PU-VK-C-11	633	1	15.40
PU-VK-C-12	633	1	23.25
PU-VK-C-13	633	2	.07
PU-VK-C-14	633	7	.08
PU-VK-C-15	633	1	.93
PU-VK-C-16	633	2	.15
PU-VK-C-17	633	1	.21
PU-VK-C-33	633	1	.31
PU-VK-C-34	633	1	2.32
PU-VK-C-35	633	1	.21
PU-VK-C-36	633	2	.31
PU-VK-C-37	633	1	.15
PU-VK-C-38	633	8	.17
TA-AE-A1-18	649	1	.20
TA-AE-A1-19	649	1	.05
TA-AE-A1-20	649	1	.15
TA-AE-A1-21	649	1	.25
TA-AE-A1-24	649	1	.25
TA-AE-A1-25	649	1	.10
TA-AE-A1-26	649	1	.10
TA-AE-A1-27	649	1	.50
TA-AE-A1-28	649	1	.10
TA-AE-A1-29	649	1	.50
TA-AE-A1-30	649	1	.10
TA-AE-A1-31	649	1	.10
TA-AE-A1-32	649	1	.10
TA-AE-A1-33	649	1	2.50
TA-AE-A1-35	649	1	1.50
TA-AE-A1-37	649	1	.30
TA-AE-A1-40	650	1	.15
TA-AE-A1-41	650	1	1.50
TA-AE-A1-42	650	1	.85
TA-AE-A1-43	650	1	.65
TA-AE-A1-44	650	1	2.00
TA-AE-A1-45	650	1	.30
TA-AE-A1-46	650	1	.10
TA-AE-A1-47	650	1	.30
TA-AE-A1-48	650	1	.10
TA-AE-A1-54	650	1	.20
TA-AE-A1-55	650	1	.05
TA-AE-A1-56	650	1	.15
VA-HA-C1-1B	625	1	1.00
VA-HA-C1-2	625	2	.50
VA-HA-C1-3	625	1	.15
VA-HA-C1-4	625	1	3.85

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Unit Price	Part No.	Page	No. Req.	Unit Price
VA-HA-C1-5	625	1	.85	WM-BM-A1-71c	645	2	.08
VA-HA-C1-6	625	1	.35	WM-BM-A1-71d	645	2	.08
VA-HA-C1-7	625	1	.20	WM-BM-A1-71e	645	2	.08
VA-HA-C1-8	625	1	.05	WM-BM-A1-71f	645	4	.08
VA-HA-C1-9	625	1	.75	WM-BM-A1-72	645	2	.08
VA-HA-C1-10	625	1	.25	WM-BM-A1-73	645	1	.42
VA-HA-C1-11	625	1	5.50	WM-BM-A1-73b	645	1	1.05
VA-HA-C1-12	625	1	3.50	WM-BM-A1-74b	645	1	1.01
VA-HA-C1-13a	625	4	.15	WM-BM-A1-75	645	1	2.35
VA-HA-C1-13b	625	4	.15	WM-BM-A1-75b	645	1	.34
WA-TC-A1-1	620	1		WM-BM-A1-76	647	1	1.01
WA-TC-A1-2	620	1		WM-BM-A1-77a	647	10	.13
WM-BM-A1-62	645	1	.17	WM-BM-A1-78	647	1	12.77
WM-BM-A1-62a	645	2	.01	WM-BM-A1-79	647	1	9.67
WM-BM-A1-63	645	1	5.04	WM-BM-A1-79b	647	1	.84
WM-BM-A1-63b	645	1	.59	WM-BM-A1-80	647	1	11.76
WM-BM-A1-64	645	1	.21	WM-BM-A1-81	647	2	.67
WM-BM-A1-65	645	1	.21	WM-BM-A1-82a	647	2	1.01
WM-BM-A1-65a	645	1	.42	WM-BM-A1-84b	647	1	1.34
WM-BM-A1-66	645	1	.67	WM-BM-A1-86	647	1	10.92
WM-BM-A1-67	645	1	1.01	WM-BM-A1-88	647	1	10.92
WM-BM-A1-68	645	1	1.01	WM-BM-A1-89	647	1	.08
WM-BM-A1-69	645	1	.59	WM-BM-A1-90	647	1	.08
WM-BM-A1-70	645	1	.50	WM-BM-A1-91	647	1	.34
WM-BM-A1-71a	645	2	.02	WM-BM-A1-92	647	2	.13
WM-BM-A1-71b	645	8	.02				

NUMERICAL INDEX
LE ROI ENGINE PARTS LIST

No. req. is total for the entire parts list.

Prices subject to change without notice.

The items marked "T" should not be purchased separately, only as part of the sub-assembly.

Part No.	Page	No. Req.	Unit Price
T1S8-10	823	1	.05
T1S8-10	823		.05
1A8-223	805	4	4.70
1A13-242	806	1	12.00
1A36-234	815	1	1.20
1A78-43	817	1	3.50
1A81-175-1	815	1	18.00
B2-54E	822	1	3.00
WA-2	821	1	.05
02-1	815	5	.10
02-4	814	4	.10
02-7	811	4	.10
02-16	817	5	.10
02-18	815		
	816		
	817	12	.10
02-20	806		
	816		
	818	15	.10
02-22	816	2	.10
2A27-799	808	1	12.00
02-32	805	3	.10
02-36	805	1	.04
02-37	811	1	.10
02-38	815	6	.04
02-39	811	4	.10
02-41	811	3	.10
02-44	805	1	.10
02-54	805	2	.10
2A61-1-14	812	1	.24
02-66	804	2	.10
02-70	805		
	815	4	.10
02-72	805	2	.10
02-76	805	2	.10
2A98-35	809	8	1.20
2-146	808	1	24.00T
A3-23	822	1	3.50
3A2-146	808	1	29.00
3A68-641-2	817	1	30.00
03-92	806	6	.10
03-96	814		
	815	14	.10
3-172	816	1	7.00
03-619	805	2	.10
08-621	817	6	.10
03-623	817	2	.10
08-633	817	2	.10
03-1546	817	1	.15
04-13	814		
	815	14	.10
04-18	817	2	.10
04-101	814	4	.10
04-102	816		
	817		
	818	22	.10
4-113	804	1	1.40
4-114	804	1	1.40
4-115	804	1	1.60
4-146	805	4	T
4-152	808	1	.10
04-405	805	3	.10
04-407	815	1	.10
04-601	811	1	T
04-608	809		
	811	14	.01
04-606	815	1	.05
04-703	808	3	.02
04-705	808	12	—
04-957	809	1	.10
04-1108	815	1	.10
WA-5-4	821	1	.05
WA-5-16	821	1	.05
05-5	806	6	.10
05-49	811		
	814		
	817	14	.01
05-50	806		
	808		
	813		
	815		
	816		
	817		
	818	42	.10
05-51	805		
	806		
	809		
	811		
	812		
	815	28	.01
05-52	805	2	.10
05-53	805		
	815	8	.01
5-295	804	1	34.00T
A5-295	804	1	38.00
6A2-146	808	1	
06-3	808	4	.10
WA-6-3-CA	820		
	821	5	.05
06-67	818	1	.10
06-69	813		
	818	9	.10
6-143	806	1	16.00
07-3	811		
	818	4	.10
7A13-270	811	1	24.50
07-21	818	3	.10
07-28	805	8	.02
7-61	805	4	6.60T
T8S8-7	823	1	.10
T8S10-9	823		.10
T8S10-13	823		.10
8A100-174	804	1	104.00
8-223	806	4	3.50T
09-2	806	1	.02
09-6	815	1	.10
09-9	804	1	.02
9-359	805	1	20.00
A9-359	805	1	23.00
10A7-61	805	4	6.60
010-9	809	3	.02
010-56	811		
	815	2	.02
010-131	805	2	.06
010-202	818	1	.02
10-302	813	1	11.00
010-315	811	2	.10
011-3	804	1	.02
011-103	806	1	.15
011-106	817	1	.10

NUMERICAL INDEX (Continued)

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Unit Price
48-330	818	1	.90
48-368	818	1	1.60
49-48	811	1	.24
A49-44-1	811	1	1.50
50-54	816	1	1.50
C51-15	823	1	.75
CT52-1	823		.05
C52-3	822		.45
52-48	804		
	815	2	.50
53-29	813	2	.02
53-144	813	6	.10
53-150	804	1	.32
53-152	805	8	.08
53-180	812	2	
53-216	809	4	.05
C54-13	823	1	.40
C54-14	823	1	.60
55-370	808	1	.32
55-372	809	1	.74
55-568	817	1	T
T56-10	822		
T56-23	822	2	.05
T56-24	823	3	.05
58-32	808	8	.05
60-33	808	1	1.50
A60-43-53	808	1	.30
WA-61	820		.05
61-1-14	812	1	T
61-1-42	812	3	T
A61-1-42	812	3	.24
61-5	804		
	805		
	806	6	.02
61-10-13	812	1	
A61-10-13	812	1	T
61-301	806	1	.02
62-36	812	1	.04
62-36-1	812	1	.04
62-36-2	812	1	.04
62-36-3	812	1	.04
CT63-2	822	3	.10
63-48	811	1	.90
64-31	808	4	.60
64-36	808	8	.02
65-354	813	1	1.20
65-487	814	1	1.10
65-492	815	1	1.10
68-387-1	817	2	3.20
68-641-2	817	1	12.00
A69-265	817	1	24.00
C71-9	822	1	1.20
A71-380	815	1	44.00
73-1-15	814	1	.06
T73-9	822		.10
T73-9	822		.10
73-26-2	815	1	.10
73-253	817	1	2.00
A73-253-11	808	1	2.00
74-7	815	2	.03
74-61	804	8	.16
A76-42	812	1	.90
A77-22	817	1	.90
A77-206	808	1	2.50
A77-211	813	1	8.50
78-43	817	1	T
79-34	814	24	.10
79-35	815	18	.10
C81-26	823	1	.75
A81-175	815	1	8.00
83-26	817	2	.80
83-61	817	1	.06
A84-331-1	813	1	9.70T
C85-65	822	1	1.30
A85-126	812	1	32.50
86-8	812	4	.60
C88-12	822	1	.15
A89-104	813	2	.50
89-105	817	1	1.20
CT91-1	823		.10
A98-35	809	8	.80
99-62	804	8	.50

Part No.	Page	No. Req.	Unit Price
100-174	804	1	T
C101-2	822		.75
101-27	815	1	10.00
105-2	813	2	.04
B105-8	812	2	.08
C105-19	823		.50
105-42	808	4	.08
105-198	804	8	.24
105-199	804	4	.24
105-200	808	4	.24
105-201	809	2	.10
105-204	808	2	.14
105-264	804	3	.24
WA-106	820		.05
C106-2	822		.35
106-153	805	4	.12
106-155	804	6	.24
106-156	804	3	.08
106-157	815	1	.16
106-158	806	3	.16
106-159	809	8	.16
106-160	809	1	.80
A106-160	809	1	2.20
WA-107	820		.05
C109-2	822		.35
C111-14	823	1	.10
116-74	815	1	3.00
C117-32	822	1	.05
C118-3	823		.75
A120-2	814	1	.80
C120-35	822	1	.20
SC-121-4-CA	820	2	.05
121-5	812	2	.04
121-14	812	4	.01
121-63	812	4	T
124-2	812	4	.16
125-26	811	1	.16
125-29	811	1	.30
132-103	815	1	2.00
CR134-1	823		.20
C136-3	823	2	.05
C138-42	822		.25
C140-2	823		.05
C140-33	822	1	.20
C142-27	822	1	.10
150-1	812	1	.04
175-8-1	804	4	6.60
181-17	811	1	2.50
182-2	808		
	809	7	.06
182-8	806	2	.10
A182-12	808	2	.08
A182-20	806	2	.30
A182-32	808		
	809	5	.10
IS-222	820	2	.05
OW-222	825	1	.05
WA-288	820	5	.05
OW-352	825	1	.15
OW-361	825	1	.35
OW-363	825	1	.15
OW-408	825	1	.90
OW-432	825	1	.25
OW-446	825	1	.15
OW-447	825	1	.30
OW-462	825	1	.15
IS-504	820	2	.05
NP-521	820	1	.10
PK-521	820	1	.25
WN-521	820	1	.05
GG-522	821	1	.05
GA-524	820	1	.15
WA-528	820	1	.05
BR-529	820	1	.25
BK-566	821	1	.85
PN-731	822	2	.05
NT-731	821	1	.25
SC-732	821	1	.10
PK-734	822	1	.05
SP-736	821	1	.95
CA-739	821	1	.65
PN-1001	820	2	.05

NUMERICAL INDEX (Continued)

Part No.	Page	No. Req.	Unit Price	Part No.	Page	No. Req.	Unit Price
KY-1004	821	1	.05	BK-5258	820	1	8.50
PN-1007	821	1	.05	BK-5259	820	1	1.30
WA-1009	820		.05	WA-5280	820	4	.05
EC-1012	821	1	.05	WA-5281	820	2	.05
WA-1012	821	1	.05	GE-5282	820	1	2.10
SP-1021	820	1	.05	BK-5283	821	1	.05
WA-1034	820	2	.05	RT-5294	820	1	11.75
SC-1037-CA	820	4	.05	D5605	822		.95
SC-1060	821	2	.05	HB-7328	821	1	1.50
WA-1070	820	1	.05	PL-7370	821	1	
WA-1071	820	1	.05	D-8497-1	822		.50
WA-1116	821	1	.05	10344	824	2	.05
X-1537	824	1	.45	19561	824	1	.10
P-2734	824	1	.25	19565	824	2	.10
P-2647	824	1	.30	19888	824	1	.03
D2688	823		.10	19911	824	1	.05
P-2690	824	1	.25	19926-2	824	1	1.00
P-2706	824	1	.20	19954	824	1	.08
P-2859	824	1	.50	20359-1	824	1	1.10
P-3224	824	1	2.55	20380	824	1	.75
D4107	823		.05	23506-1	824	1	T
P-4543	824	1	.20	23507	824	1	.10
RG-5210	820	1	.05	24895-1	824	1	T
GA-5215	820	2	.05	PL-52125	820	2	.05
HG-5221	820	1	9.50	CV-52126	820	2	.15
NP-5222	820	2	.10	DP-52231	820	1	3.50
EC-5224	821	1	.10	BB-60226	820	2	1.55
WK-5231	821	1	.05	SA-65972	821	2	.50
CW-5232	820	1	.70	NT-67446	821	1	.15
LE-5236	821	1	.60	HG-73120	821	1	2.60
CL-5238	821	1	5.15	WA-81751	820	1	.05
GE-5238	820	1	.85	FP-81953	821	4	.05
WA-5245	820	1	.05	IS-82927	821	4	.05
SD-5249	820	1	.10	WA-98922	820	4	.05
SP-5254	820	1	.05	KL-100657	821		.05